Schwank
INNOVATIVE HEATING SOLUTIONS

infrasave
radiant heaters

ultraSchwank Model: UHE & InfraSave Ultimate Model: EIH

HIGH RADIANT OUTPUT LOW INTENSITY TUBE TYPE INFRA RED HEATER

Certified to ANSI Z83.20 / CSA 2.34 Latest Edition

INSTALLATION / OWNER'S MANUAL

WARNING Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death.

Read the installation and operating and maintenance instructions thoroughly before installing or servicing this equipment.

SAFETY ALERT:

This heater must be installed and serviced only by a trained gas service technician. Failure to comply could result in personal injury, death, fire and/or property damage.

Do not store or use gasoline or other flammable vapours and liquids in the vicinity of this or any other gas fired appliance.

IF YOU SMELL GAS:

- Extinguish any open flame
- Do not attempt to light this or any other appliance
- Don't touch any electrical switch, or telephone
- Immediately call your gas supplier from a neighbor's phone
- Follow any and all instruction from your gas supplier
- If your gas supplier is not available, call the fire department

FIELD CONVERTIBILITY:
This appliance is not field convertible to LP gas.

Keep this manual in a secure place .
Record for future reference:

Model #: _____

Serial #: _____
(located on heater rating label)

CERTIFIED ® DESIGN CERTIFIED ®

UHE-F / EIH-F I&O Manual
IM100205
RD: MAY 2014
RL: 06A

NOTICE:

This manual is current for this product. Occasional revision of the product Certification Standard may require changes to the product and/or this manual.

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ultraSchwank & InfraSave Ultimate SERIES

HIGH RADIANT OUTPUT GAS INFRARED TUBE HEATER

Model UHE / EIH - Indoor Commercial / Industrial

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WARNING

Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read and understand this installation and operation manual thoroughly prior to assembly, installation, operation or service to this appliance.

This heater must be installed and serviced only by a trained gas service technician.

Do not store or use gasoline or other flammable vapours and liquids in the vicinity of this or any other gas fired appliance.

Failure to comply could result in personal injury, death, fire and/or property damage.

Do not store or use gasoline or other flammable vapours and liquids in the vicinity of this or any other gas fired appliance.

This appliance may have sharp edges and corners. Wear protective clothing such as gloves and protective eye wear when servicing this or any other appliance.

APPLICATION

This appliance has been certified by CSA International to ANSI Z83.20 / CSA 2.34 latest edition.

A gas-fired radiant tube heater may be installed for heating of commercial / industrial non-residential spaces. It is beyond the scope of these instructions to consider all conditions that may be encountered. Installation must conform with all local building codes or, in the absence of local codes, with the National Fuel Gas Code, ANSI Z223.1/NFPA 54 in the U.S.A. or the Natural Gas and Propane Installation Code, CSA B149.1 in Canada. The latest edition Electrical Code ANSI/NFPA N0 70 in the U.S.A. and PART 1 CSA C22.1 in Canada must also be observed.

Installation of a gas fired tube heater must conform to all heating installation design procedures including clearance to combustibles, connection to the gas and electrical supplies, and ventilation.

This heater is not for installation in a Class 1 or Class 2 explosive environment, nor a residence. If installation of this equipment is in question, consult with local authorities having jurisdiction (Fire Marshall, labor department, insurance underwriter, or others).

Revisions to codes and/or standards, may require revision to equipment and installation procedures. In case of discrepancy, the latest codes, standards, and installation manual will take priority over prior releases.

Models UHE, EIH may be installed for heating of commercial / industrial non-residential **indoor spaces.**

WARNING — Heater Expansion

It is a normal condition that during heat-up and cool-down a tube heater will expand and contract. Allowances for heater expansion must be made in the gas connection, venting and combustion air ducting. Improper installation, alteration, or adjustment can result in property damage, injury or death. **Refer to Section 13**

WARNING — Gas Connection

Improper installation, connection, or adjustment can result in property damage, toxic gases, asphyxiation, injury or death. Using an approved flexible gas connector in the USA or Type 1 hose connector in Canada, the gas supply to the heater must be connected and tested in accordance with all local, state, provincial, and national codes (ANSI Z223.1/NFPA 54 in USA; B149.1 in Canada) and as indicated in this manual. **Refer to Section 13**

WARNING — Venting

Inadequate venting of a heater may result in asphyxiation, carbon monoxide poisoning, injury or death. This heater may be directly or indirectly vented from the space. Venting must be in accordance with all local, state, provincial, and national codes (ANSI Z223.1/NFPA 54 in USA; B149.1 in Canada) and as indicated in this manual. **Refer to Sections 11 & 12**

WARNING — Start-Up 'SMOKE' Condition

During start up, the heating of material coatings used in the production process of tubes and reflectors will create smoke during the initial period of operation. This condition is normal and temporary .

Ensure that there is sufficient ventilation to adequately clear any smoke from the space.

Notify site and safety personnel to ensure that alarm systems are not unduly activated.

IMPORTANT — THERMOSTAT SETTING FOR COMFORT

Infrared radiant (IR) heating system provide comfort with the effect of radiant heat and ambient air heat.

If your IR system is controlled with a thermostat (TruTemp or ThermoControl Plus) that senses radiant heat, then set the thermostat to the desired comfort temperature (ie: 65°; 68°; 20°C).

If your IR system is controlled with a standard 24V or 120V thermostat that senses only air temperature, then start with a thermostat setting that is 5° to 7°F (3° to 5°C) lower than the desired comfort temperature. Some trial and error setting may be required to 'fine tune' the comfort temperature that best suits your site and provides most economical operation.

WARNING Tube "GLOW"

It is a normal condition that the combustion tube (1st tube) can appear to "glow red". For inputs up to 150,000 Btuh, the top surface of the tube can appear red where heat is trapped between the reflector and the tube. The stainless steel tube used for inputs 175,000 and greater can appear to entirely glow red. The tube material is designed into the heater because it can withstand the high temperature of combustion, and the "red glow" is a normal occurrence.

WARNING Clearance to combustibles

Location of flammable or explosive objects, liquids or vapors close to the heater may cause fire or explosion and result in property damage, injury or death. Do not use, store or locate flammable or explosive objects, liquids or vapors in proximity of the heater.

The clearance to combustible material represents the minimum distance that must be maintained between the outer heater surface and a nearby surface. The stated clearance to combustibles represents a surface temperature of 90F° (50C°) above room temperature. It is the installer's responsibility to ensure that building materials with a low heat tolerance which may degrade at lower temperatures are protected to prevent degradation. Examples of low heat tolerance materials include vinyl siding, fabrics, some plastics, filmy materials, etc.

In locations used for the storage of combustible materials, signs must be posted to specify the maximum permissible stacking height to maintain the required clearances from the heater to the combustibles. Such signs must either be posted adjacent to the heater thermostats or in the absence of such thermostats in a conspicuous location. In addition to stored or stationary material, consideration must also be given to moveable objects such as cranes, vehicles, and overhead doors, and structural objects such as sprinkler heads, electrical and gas lines, and electrical fixtures.

It is beyond the scope of these instructions to consider all conditions that may be encountered. Consult local authorities such as the Fire Marshall, insurance carrier, or safety authorities if you are uncertain as to the safety or applicability of the proposed installation.

Refer to Figure 1 and Table 1 for the certified clearances to combustibles for the appropriate model input/size.

FIGURE 1 MINIMUM CLEARANCES TO COMBUSTIBLES* - *refer to* Table 1 *for values*

NOTE: USE AN INDELIBLE MARKER TO ENTER VALUES 'H', 'S', 'F', & 'B' ON THE 'PEEL & STICK' SIGN PROVIDED.

POST THE SIGN ADJACENT TO THE HEATER THERMOSTAT OR IN A PROMINENT LOCATION. *See next page for details.*

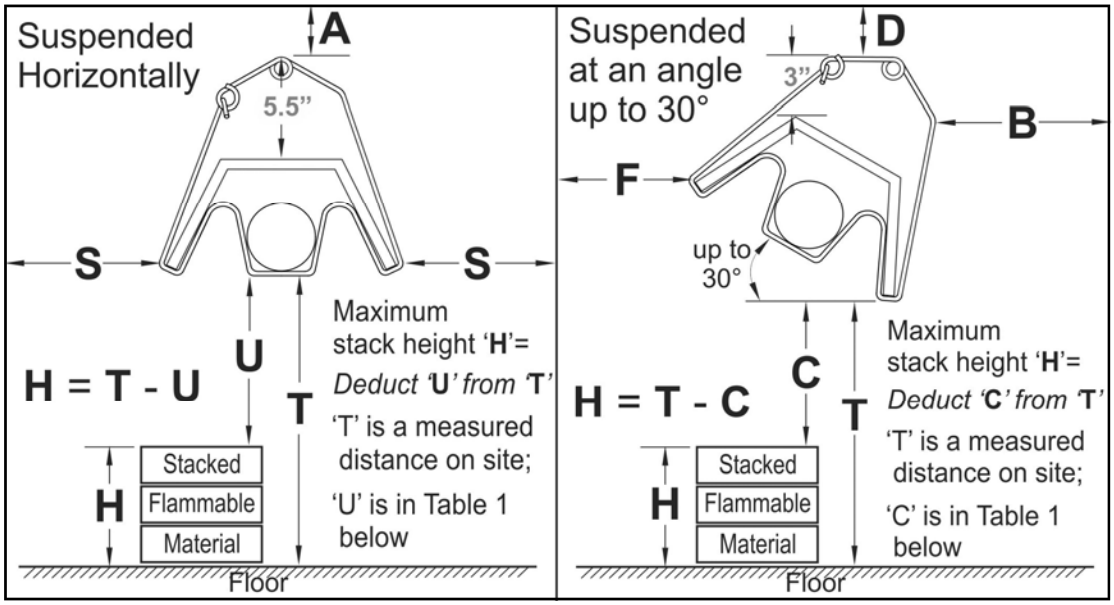


TABLE 1 MINIMUM CLEARANCES TO COMBUSTIBLES* *(measured from the hanger)*

MODEL	SUSPENDED HORIZONTALLY			SUSPENDED AT AN ANGLE OF 30 DEGREES			
	A inches (cm)	**S** inches (cm)	**U** inches (cm)	**D** inches (cm)	**B** inches (cm)	**F** inches (cm)	**C** inches (cm)
UHE / EIH 60	**0.5** (1.25)	**16** (41)	**45** (114.3)	**1.0** (2.5)	**3.25** (8.3)	**35** (89)	**41** (104)
UHE / EIH 90	**1.25** (3.2)	**26** (66)	**70** (178)	**2.5** (6.4)	**5.25** (13.3)	**50** (127)	**60** (152)
UHE / EIH 130	**1.5** (4)	**30** (76.2)	**86** (218.5)	**3.0** (7.6)	**6.25** (16)	**57** (145)	**70** (178)
UHE / EIH 160	**3.0** (7.6)	**45** (114.3)	**105** (267)	**5.5** (14)	**10** (25.4)	**75** (191)	**85** (216)
UHE / EIH 200	**3.5** (9)	**56** (142.2)	**111** (282)	**8.0** (20.3)	**12.5** (31.8)	**90** (229)	**93** (236)
Heaters mounted at an angle between 0° & 30° must maintain the greater clearance listed for either 0° or 30°. (A or D; S or F, S or B; U or C)							

*The clearance to combustible materials represents the minimum distance that must be maintained between the heater and a nearby surface. **The stated clearance to combustibles represents a surface temperature of 90F° (50C°) above room temperature.** .

NOTE that in the above table the **clearances are measured from the hanger** to facilitate the correct locating of the heater during installation.

It is the installer's responsibility to ensure that building materials with a low heat tolerance which may degrade at lower temperatures are protected to prevent degradation. Examples of low heat tolerance materials include vinyl siding, fabrics, some plastics, filmy materials, etc.

VENT END CLEARANCE: Clearances from the vent pipe are determined by local or national installation codes, but must not be less than 6 inches (15 cm). For 'unvented' installation, a minimum distance of 24 inches (61 cm) is required from the end of heater to a combustible surface.

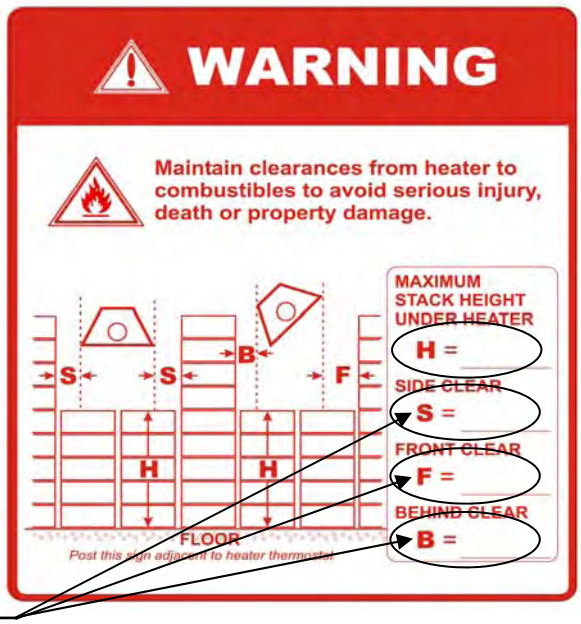
WARNING **In locations used for the storage of combustible materials: Signs must be posted** specifying the *maximum permissible stacking height* to maintain the required clearances from the heater to the combustibles. The signs must be posted either adjacent to the IR heating system thermostats or in the absence of such thermostats, in a conspicuous place.

For your convenience a "peel and stick" sign is provided with this heater. Use a permanent marker to record the required dimensions on the sign.

To calculate the value '**H**': (**H** = **T** - **C**)

- Measure the on site distance between bottom of the heater and the floor = '**T**' inches (cm).
- Subtract the clearance below the heater '**C**' from '**T**' (see Table 1 for the value '**C**' that corresponds to the model you are installing).
- Enter this value '**H'** on the sign.

Refer to the information for the heater model being installed in Figure 1 and Table 1 to get the values for dimensions '**S**', '**F**' and '**B**'.



Post this sign as instructed above.

1. LABOR REQUIRMENTS

Two persons are required to safely install this equipment. Each insulated reflector assembly weighs approximately 50 pounds (23 kg). Wear gloves and other required safety protection.

2. INSTALLATION IN COMMERCIAL AIRCRAFT HANGARS

Low intensity radiant tube heaters are suitable for use in aircraft hangars when installed in accordance with the latest edition of the Standard for *Aircraft Hangars*, ANSI/NFPA No 409 in the USA, or the Canadian *Natural Gas and Propane Installation Code*, B149.1.

A. A minimum clearance of 10 ft (3 m) above either the highest fuel storage compartment or the highest engine enclosure of the highest aircraft which may occupy the hangar. The clearance to the bottom of the heater shall be measured from the upper surface of either the fuel storage compartment or the engine enclosure, whichever is higher from the floor.

B. A minimum clearance of 8 ft (2.4 m) must be maintained from the bottom of the heater to the floor in other sections of the aircraft hangar, such as offices and shops, which communicate with areas for servicing or storage. Refer to Section 1 for proper mounting clearances to combustibles.

C. Heaters must be located so as to be protected from damage by aircraft and other objects, such as cranes and movable scaffolding.

D. Heaters must be located so as to be accessible for servicing and adjustment.

3. INSTALLATION IN COMMERCIAL GARAGES AND PARKING STRUCTURES

Low Intensity Heaters are suitable for use in commercial garages when installed in accordance with the latest edition of the Standard for *Parking Structures*, ANSI/NFPA 88A, or the Standard for *Repair Garages*, ANSI/NFPA No. 88B, or the Canadian *Natural Gas and Propane Installation Code*, B149.1.

WARNING An overhead heater shall be located high enough to maintain the minimum distance to combustibles, as shown on the heater rating plate, from the heater to any vehicles parked below the heater.

Overhead heaters shall be installed at least 8 ft (2.4 m) above the floor.

4. INSTALLATIONS OTHER THAN SPACE HEATING

Use for process or other applications that are not space heating will void the C.S.A. certification and product warranty. Process application requires field inspection and/or certification by local authorities having jurisdiction.

WARNING

Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read and understand this installation and operation manual thoroughly prior to assembly, installation, operation or service to this appliance.

This heater must be installed and serviced only by a trained gas service technician.

Do not store or use gasoline or other flammable vapours and liquids in the vicinity of this or any other gas fired appliance.

Failure to comply could result in personal injury, death, fire and/or property damage.

Do not store or use gasoline or other flammable vapours and liquids in the vicinity of this or any other gas fired appliance.

5. PRE INSTALLATION SURVEY

It is recommended that a full heating design including heat loss calculation be conducted on the structure or area to be heated. Heater sizing and placement must consider available mounting height, sources of greatest heat loss, and the certified clearances to combustibles with respect to stored material, moveable objects (cranes, vehicles, lifts, overhead doors, etc), sprinkler system heads, and other obstructions on the site. Consideration must also be given to vent / duct placement and the allowable combined lengths of vent and duct. Carefully survey the area to be heated, and for best results place burner and combustion chamber in the coldest area(s).

Installation must conform with all local, state, provincial and national code requirements including the current latest edition ANSI Z223.1 (NFPA 54) in the U.S.A. and B149.1 installation code in Canada, for gas burning appliances and equipment. The latest edition Electrical Code ANSI/NFPA N0 70 in the U.S.A. and PART 1 CSA C22.1 in Canada must also be observed.

The heating system must have gas piping of the correct diameter, length, and arrangement to function properly. For this reason, a layout drawing is necessary.

6. MOUNTING CLEARANCES

This heater must be mounted with at least the minimum clearances between the heater and combustibles as shown in FIG-1, TABLE 1, Page 3. It is the installer's responsibility to ensure that building materials with a low heat tolerance which may degrade at lower temperatures are protected to prevent degradation. Examples of low heat tolerance materials include vinyl siding, fabrics, some plastics, filmy materials, etc.

Positioning of lights, sprinkler heads, overhead doors, storage areas, gas and electrical lines, parked vehicles, cranes and any other possible obstruction or hazard must be evaluated prior to installation.

Ensure adequate clearance around the air intake at the burner to allow sufficient combustion air supply to the heater.

6A. SERVICE CLEARANCE: The lower 'jaw' of the burner cabinet swings down to provide convenient service access to burner components. Provide a minimum clearance from any wall or obstruction of 6 inches (15 cm) to the access end of the burner housing, and a minimum of 24 inches (61 cm) to any ONE side to allow servicing of burner, blower and controls. (see Figure 2) - the minimum clearances to combustibles must always be maintained.

For guidelines to heater placement refer to TABLE 2 (below).

FIGURE 2

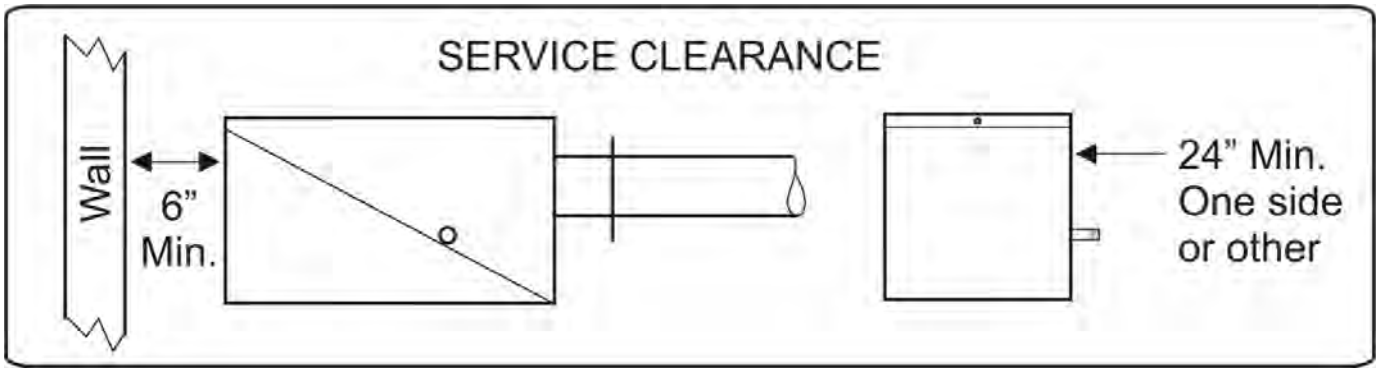


TABLE 2 GUIDELINES FOR HEATER PLACEMENT - SPACE HEATING

MODEL	RECOMMENDED MOUNTING HEIGHT RANGE* ft (m)	MAXIMUM DISTANCE BETWEEN HEATERS ft (m)	DISTANCE – OUTSIDE WALL TO HEATER LONG AXIS (PARALLEL TO WALL) IN "FEET"	
			HORIZONTAL REFLECTOR MOUNT ft (m)	REFLECTOR ANGLE MOUNTED
UHE / EIH 200	**20 – 40** (6 - 12)	**50** (15)	**17 – 25** (5 - 8)	COMBUSTIBLE CLEARANCE BEHIND (refer to Table 1 & Figure 1)
UHE / EIH 160	**18 – 30** (5 - 9)	**45** (14)	**15 – 20** (5 - 7)	
UHE / EIH 130	**16 – 25** (5 - 8)	**40** (12)	**15 – 20** (5 - 7)	
UHE / EIH 90	**14 – 22** (4.3 - 6)	**30** (9)	**12 – 16** (4 - 5)	
UHE / EIH 60	**12 – 20** (3.6 - 5.5)	**25** (8)	**11 – 15** (3.4 - 5)	

* RECOMMENDED MOUNTING HEIGHTS are typical to provide optimum comfort in general space heating applications. Variance to these typical heights can occur in some applications:

- Higher mounting heights due to structure or application requirements
- Lower mounting heights for area or 'spot' heat, or in areas with greater infiltration losses (near overhead doors, etc)

IMPORTANT: Single or multiple heater placement must be such that continuous operation of heater(s) will not cause combustible material or materials in storage to reach a temperature in excess of ambient temperature plus 90F° (50C°).

It is the installer's responsibility to ensure that building materials with a low heat tolerance which may degrade at lower temperatures are protected to prevent degradation. Examples of low heat tolerance materials include vinyl siding, fabrics, some plastics, filmy materials, etc.

Refer to "Clearance to Combustibles" information on pages 6 to 8, and Figure 1 and Table 1.

7. SYSTEMS INCORPORATING 90° ELBOWS AND 180° ELBOWS

The radiant tube heater can be installed in configurations as illustrated in FIGURE 4 (below) with a maximum of two 90° tube system elbows per heater. The use of elbows reduces the total maximum vent allowable by 10 feet for each 90°. (See Section 11 : Flue venting)

The 90° elbow kit (JS-0528-UE) is complete with one 90° elbow, one tube coupler, and one reflector end cap. For a 180° elbow two x 90° kits combine to create a 180°. The reflector must be end-capped each side of an elbow - See FIGURE 6

IMPORTANT: **Location of Elbow vs. Input**: A minimum length of straight radiant tube must be connected to the burner prior to any elbow as follows:

- 200 Mbh (60 kW) = 30 ft (7.6 m) prior to elbow
- 160 Mbh (45 kW) & 130 Mbh (38 kW) = 20 ft (6 m) prior to elbow
- 90 Mbh (23 kW) = 15 ft (4.6 m) prior to elbow
- 60 Mbh (18 kW) a minimum of 10 ft (3 m) straight tube before elbow.

FIGURE 3 SYSTEM ELBOW KIT

See Figure 8 *for installed orientation dimensions*

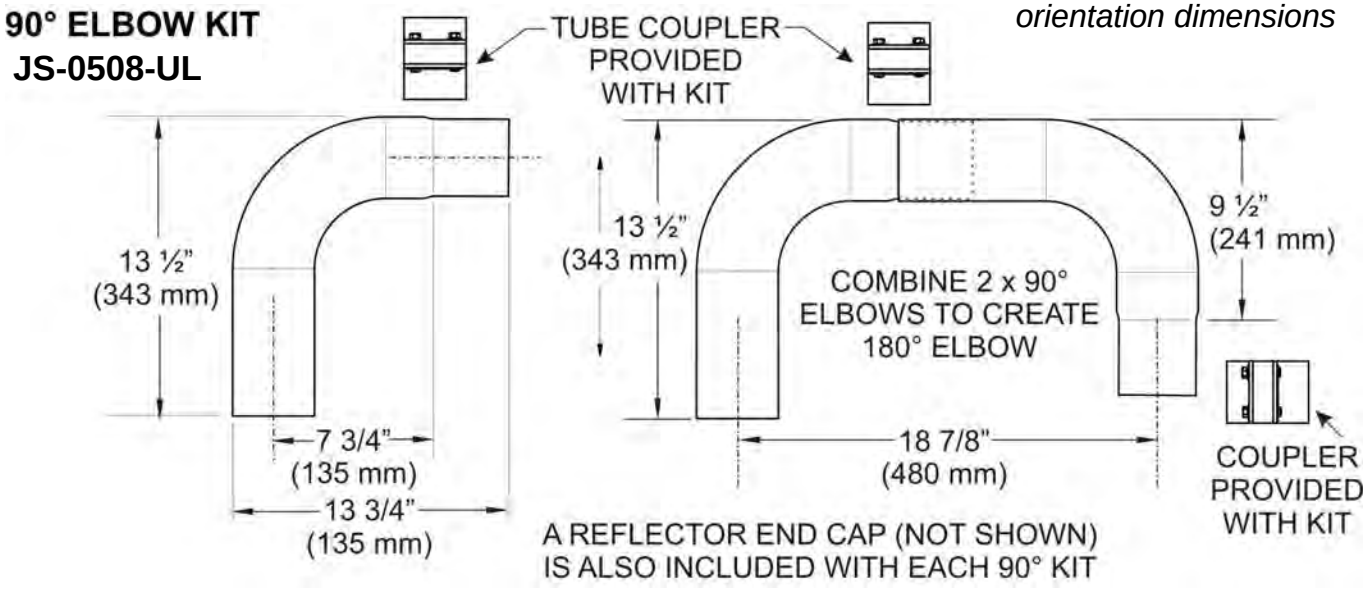
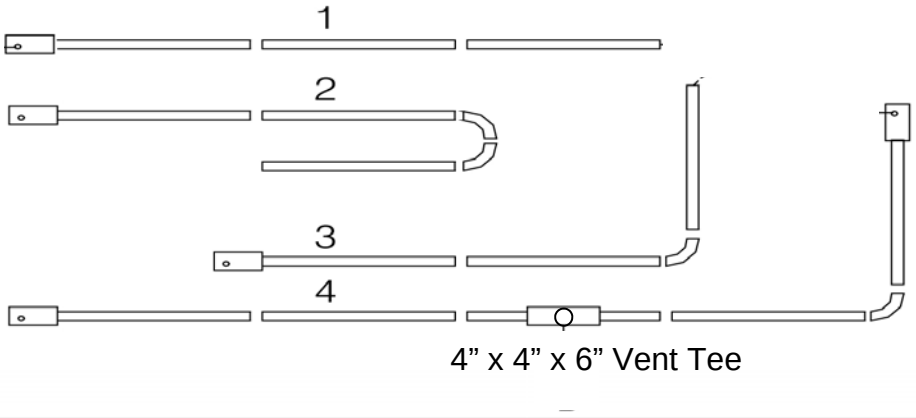

90° ELBOW KIT
JS-0508-UL
TUBE COUPLER PROVIDED WITH KIT
13 ½" (343 mm)
7 3/4" (135 mm)
13 3/4" (135 mm)
13 ½" (343 mm)
COMBINE 2 x 90° ELBOWS TO CREATE 180° ELBOW
9 ½" (241 mm)
18 7/8" (480 mm)
COUPLER PROVIDED WITH KIT
A REFLECTOR END CAP (NOT SHOWN) IS ALSO INCLUDED WITH EACH 90° KIT

FIGURE 4 SYSTEM CONFIGURATIONS



System Configuration

1 Straight line
2 "U" tube with 2 x 90° elbow kits
3 "L" tube with one 90° elbow kit
4 Twinned tubes into common TEE flue vent

8. SUSPENDING THE SYSTEM - GENERAL - *details in Section 9*

Inadequate or improper suspension of the tube heater can result in collapse of the system, property damage, and personal injury or death.

It is the installer's responsibility to ensure that the hardware and structural supports from which the heater is suspended are sound and of adequate strength to support the weight and expansion forces of the heater.

Consider that the heater will expand in length as much as 1/2 inch (12.5 mm) or more for every 10 ft (3 m) of system length – typically the greater the firing rate, the greater the expansion.

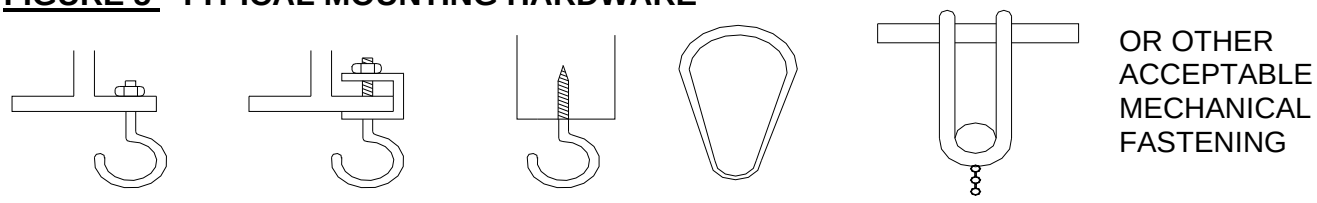
Refer to Sections 13 & 14

1) Survey the available structural supports, considering the system configuration and heat requirements of the area to establish the optimum heater location.
   a) Locating a heater directly under joists or beams, or installing supplemental steel support rail or angle iron can substantially reduce labor and materials

2) Tube system hangers must be located: A) straight in line; B) at a common height (level); and C) at appropriate distances along the heater length - *see Figure 7 page 15*.
   a) NOTE: It is important that the tubes in the system are installed in alignment horizontally (level) and vertically (in line) – this will ensure system integrity

3) Hardware with a minimum 90 lb. (41 kg) work load must be used at the first burner end hanger, and with a minimum 60 lb. (27 kg) at all other hanger suspension points. A #2 Lion Chain (equivalent or heavier gauge) is typically used to suspend the heater.
   a) Connect to the structure using typical hardware as illustrated in FIGURE 5 (below) or by other mechanically sound means
   b) If rigid devices such as 3/8" threaded rods are used for suspension, swing joints or other means must be provided to allow for system expansion - approximately ½ inch to 1 inch for every 10 ft (1 cm to 2.5 cm for every 3 m) of system length.

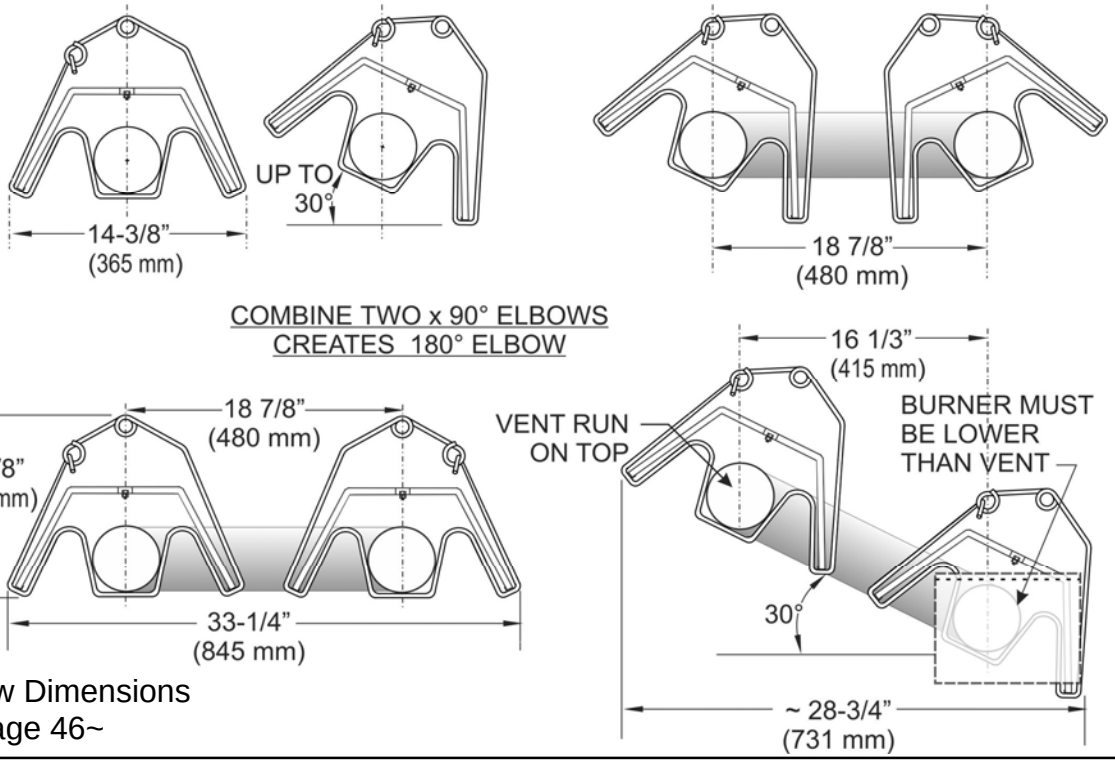
FIGURE 5 TYPICAL MOUNTING HARDWARE



NOTE: It is the installer's responsibility to ensure that mounting hardware and fastening to structure are of sufficient strength to support the system.

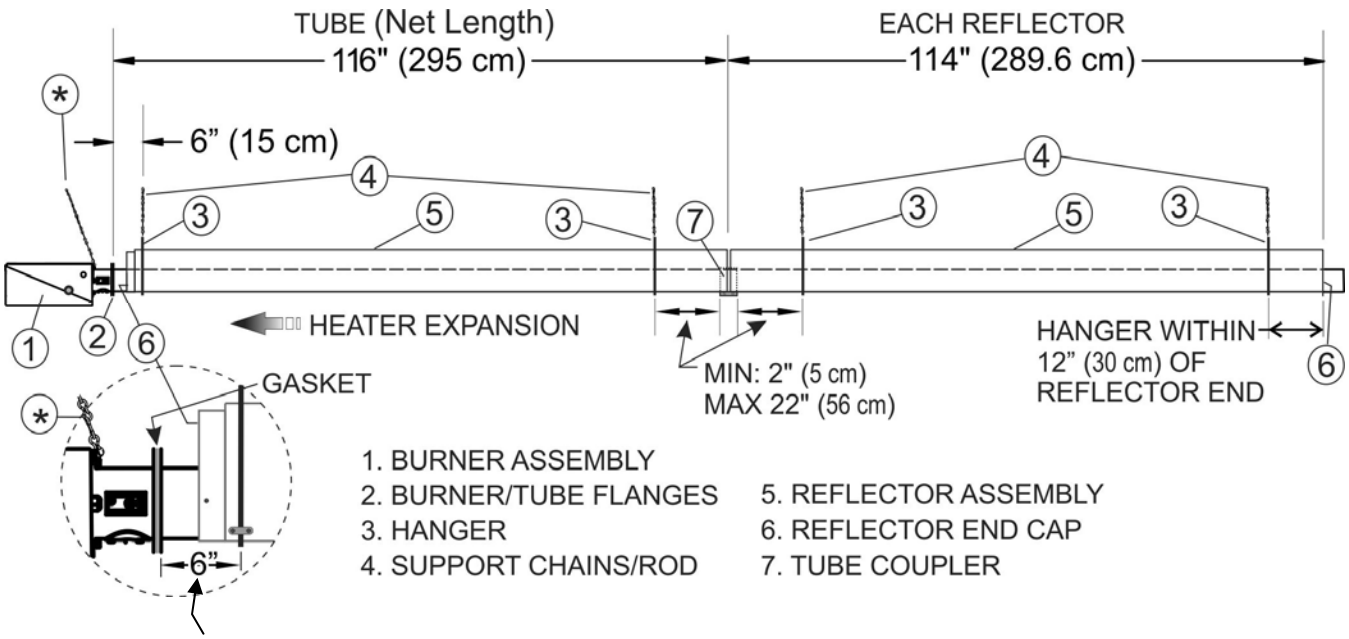
4) Hangers are provided to suspend the tube/reflector system – see FIGURES 6 & 7
   - The hangers supplied with the heater *must* be used for heater suspension, and 2 hangers are required for each tube/reflector section
   - To orient the reflector from horizontal to 30°, hangers can be suspended from either of two eye loops in the hanger - see FIGURE 6
   - Hangers are positioned along the system length as indicated in FIGURE 7 & Page 41
   - Dimensions from air intake to vent end are listed on Page 42

FIGURE 6 HANGER / REFLECTOR ORIENTATION - HORIZONTAL TO 30^0



See Elbow Dimensions
~Page 46~

FIGURE 7 HANGER POSITIONING / SPACING (Also see Page 41)



- POSITION BURNER END HANGER 6 INCHES (15 CM) FROM TUBE FLANGE
- EACH TUBE & REFLECTOR SECTION REQUIRES 2 HANGERS
- POSITION INTERMEDIATE HANGERS A MINIMUM OF 2 INCHES (5 CM) TO A MAXIMUM OF 22 INCHES (56 CM) FROM THE EDGE OF ANY TUBE COUPLER
- LOCATE VENT END HANGER WITHIN 12 INCHES (30 CM) OF THE END OF THE LAST REFLECTOR

⊛ ANGLE BURNER SUPPORT CHAIN BACK OVER BURNER TO ALLOW SYSTEM EXPANSION

9. INSTALLATION OF TUBE/REFLECTOR SYSTEM

PRIOR TO PROCEEDING with the tube installation: **Read and understand Section 8** - "**System Suspension", and Fig.1 & Table 1 Clearances to Combustible Materials**

Confirm that the Burner Kit and Tube Kit(s) on site are the proper match - see Section 26

IMPORTANT SPECIAL NOTES:

i) **UHE/EIH 160 & 200**: **Special Tube Kit & Coupling** - Refer to Section 9.1, Fig 13

- **160,000 Btuh models must use primary tube kit TK-P160-UL**
- **200,000 Btuh models must use primary tube kit TK-P200-UL**
- These 20 ft primary tube kits have an **uncoated stainless steel tube with flange as the first tube**, and:
  - 160,000 an **uncoated aluminized steel tube as the second tube**
  - 200,000 an **uncoated stainless steel tube as the second tube**
- The flange on the first tube is painted "WHITE" for easy identification
- **DO NOT USE PRIMARY TUBE KIT DESIGNED FOR LESSER INPUT MODELS**

Ii) If a turbulator is required, it is factory installed inside a clearly labeled tube as to the position in the system that the tube must be installed - **a turbulator is always located at the vent end of the system** — See Table 3

iii) **ALL MODELS:** INSTALL THE **FIRST AND SECOND TUBES** (FROM BURNER END) WITH THE **WELDED SEAM** ALONG THE TUBE LENGTH **AT THE SIDE OR FACING DOWN**

1) Hangers supplied with the system must be used to suspend the system, and be:

a) Suspended at the same height = horizontal alignment of tubes in a level orientation

b) In a straight line = vertical alignment of tubes

c) **NOTE:** Correctly locate hangers to support the system

- Each tube & reflector section requires 2 hangers
- Hangers should be located not less than 2 inches (5 cm) nor more than 22 inches (56 cm) away from the edge of any tube coupler
- See Figure 7 page 14, and Hanger Location Table page 41

2) Hardware with a minimum 90 lb. (41 kg) work load must be used at the first hanger (burner end), and 60 lb. (27 kg) at each subsequent heater suspension point. A #2 Lion Chain (equivalent or heavier gauge) is typically used to suspend the heater.

a) Fasten to the structure using hardware as illustrated in FIGURE 5 or by other mechanically sound means

b) If rigid devices such as 3/8" threaded rods are used for suspension, swing joints or other means must be provided to allow for system expansion - approximately ½ inch to 1 inch for every 10 ft (1 cm to 2.5 cm for every 3 m) of system length.

3) Suspend the first two hangers from the structure.

- Locate the first hanger so that there will be 6 inches (15 cm) between the first hanger and the tube flange

- Locate the second hanger within 6 to 24 inches (15 to 60 cm) from the swaged end of the tube
- Result: The first and second hangers are spaced apart within 86 to104 inches (218 to 264 cm)

4) Insert the swaged end of the first tube (tube with flange) through and on to the second hanger with the WELDED SEAM OF THE TUBE AT THE SIDE OR FACING DOWN

5) Insert the flanged end of the tube through and on to the first hanger . Position the tube so that the first hanger is 6 inches (15 cm) from the tube flange
   - Check that the first tube is level - make adjustment to hanger height accordingly

6) At the swaged end of the tube, slide a Torctite tube coupler past the swage on to the tube
   - **Special condition: 160,000 & 200,000 Btuh models - first, second (and third 200,000) tube joints - See Sections 9.1 & 9.2 & FIG 13 *NOW***
   - The final position of the coupler will be between the second and third hangers

7) Install a reflector over the first tube: Ensure that <u>the end with the extended inner reflector is located toward the burner</u>
   - Insert reflector through the second 'downstream' hanger first, then slide back into the first hanger
   - The downstream end of the first reflector should be located at the center of the first tube coupler

8) At the FIRST REFLECTOR, FIRST and SECOND hangers ONLY: (see FIGURE 8 below)
   - Install hanger clips (4 supplied) on hangers - one on each side of first two hangers
   - Position the hangers perpendicular (at right angle) to the tube and reflector.
   - Using sheet metal screws provided, fasten the hanger clips to each side of reflector

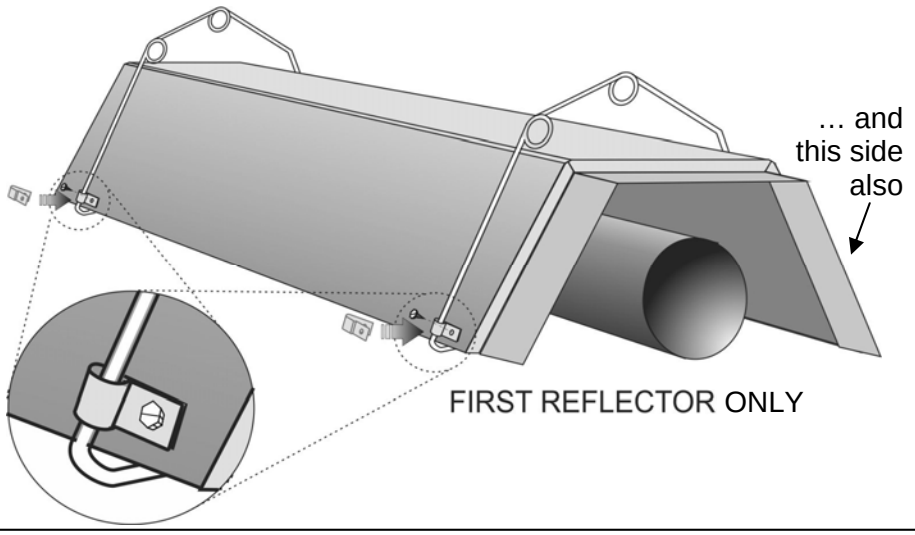
9) At ALL other reflectors and hangers: Orient the hanger perpendicular to reflector - DO NOT fasten to reflector. Allows reflector system to expand in length through hangers.

<u>FIGURE 8</u> FASTEN FIRST TWO HANGERS TO FIRST REFLECTOR (ONLY) - Each Side

Install a hanger clip (4 supplied) on to each side of first and second hangers.

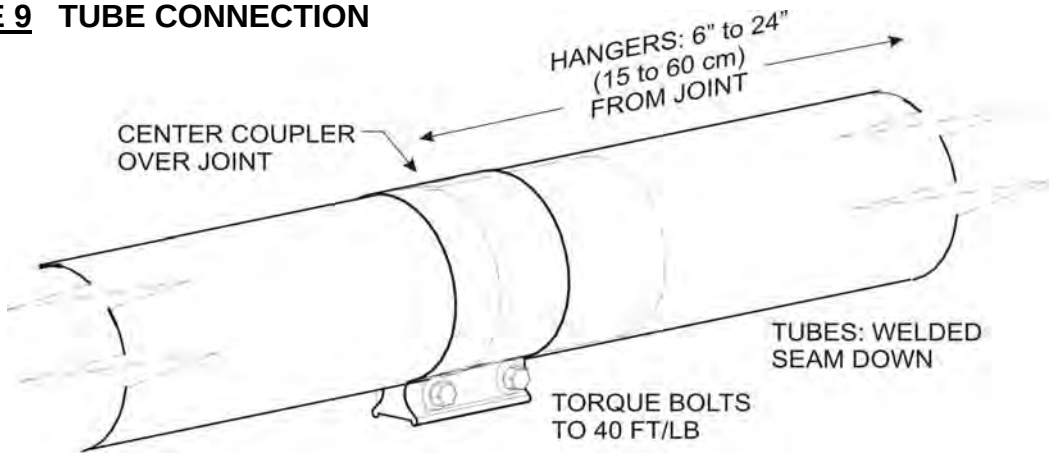
Position hangers perpendicular to reflector.

Fasten hanger clips to outer reflector with sheet metal screws (provided) each side of reflector.



10) At the burner end, install the reflector end cap inside of the extended inner reflector
    - Align holes top and sides with the slotted holes in the reflector
    - Fasten together using the three bolts/nuts provided
    - NOTE: The end cap position is between the tube flange and the first hanger. The end cap extends below the hanger (see FIG 7)
11) Suspend the next two hangers so that they are positioned within 6 to 24 inches (15 to 60 cm) of each end of the tube
    - NOTE: Tubes are 120 inches (305 cm) in length, with a swage overlap of 4 inches (10 cm) = NET length of tube in system is 116 inches (295 cm)
12) Slide a Torctite coupler over the swaged end of the first tube, past the swage.
    NOTE: 200,000 Btuh: A special stainless steel coupler is provided for the connection of the first to second tubes.
13) Install the next tube on to the hangers
    - **160,000 & 200,000 Btuh MODELS: GO TO SECTION 9.1 *NOW* FOR SPECIAL COUPLING OF 1ST & 2ND TUBES**
    - ENSURE THAT THE WELDED SEAMS OF THE 1st & 2nd TUBES ARE AT THE SIDE OR FACE DOWNWARD IN THE BOTTOM HALF OF THE TUBE
14) Slide the second tube over the swage of the first tube and snug against the swage shoulder. Ensure that the swage on the first tube is fully inserted into the second tube
15) Center the tube coupler over the tube joint and **TORQUE THE COUPLER BOLTS TO 40 FT/LBS**.

FIGURE 9 TUBE CONNECTION



16) Slide a Torctite coupler on to the exposed swaged end of the second tube
17) Check that the installed tube is level and in alignment with the tube before it - make adjustments at hangers as required
18) Install a reflector over the second tube - the inner reflector extension must face toward the burner
    - Insert reflector through the 'downstream' hanger first, then slide back though the hanger closer to the burner
19) Lift the downstream end of the second reflector slightly, and slide the inner reflector exten-

sion under the first reflector - mate snuggly with the first reflector

FIGURE 10: REFLECTOR INSTALLATION

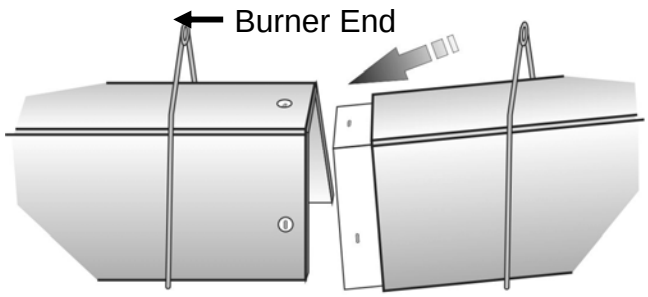
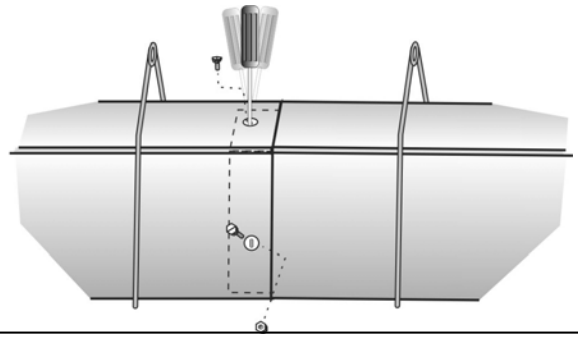


FIGURE 11: REFLECTOR ALIGNMENT



20) Through the three circular hole in the outer reflector, clear away insulation to allow access to the slotted holes in the inner reflector

21) Align the slotted holes in the first and second reflectors where they overlap - if necessary use a screw driver or similar tool to assist in alignment of the holes

22) Fasten the two reflectors together using three nuts and bolts supplied
    - ***TIP**: To place the nut on the bolt extending down through the hole at the top of the reflector, hold nut between thumb and finger, reach under the tube, then up and over the far side of the tube to align the nut to the bolt protruding through the hole*

23) Repeat steps 11 to 21, assembling one section of tube and reflector at a time until the system is complete
    - If a TURBULATOR is required in the system it is located at the VENT END

24) Install the reflector end cap at the vent end of the system using three nuts and bolts supplied

25) ENSURE THAT THE SYSTEM IS LEVEL AND THAT ALL TUBES ARE ALIGNED – MAKE ADJUSTMENT AT HANGERS AS REQUIRED—WELDED SEAM OF 1st & 2nd TUBES MUST FACE DOWN

TABLE 4 SYSTEM TURBULATORS:

MODEL	TURBULATOR
UHE / EIH 200-70	NOT REQUIRED
UHE / EIH 200-60	2 FT (61 cm)
UHE / EIH 160-60	2 FT (61 cm)
UHE / EIH 160-50	6FT (183 cm)
UHE / EIH 130-50	NOT REQUIRED
UHE / EIH 130-40	6 FT (183 cm)
UHE / EIH 90-40	NOT REQUIRED
UHE / EIH 90-30	3 FT (91 cm)
UHE / EIH 60-30	NOT REQUIRED
UHE / EIH 60-20	6 FT (183 cm)

NOTE: Improper location of a turbulator can cause malfunction or damage to the heater and will void the warranty.

Tube Heaters are supplied with the required turbulator factory installed into the tube.

Tubes with turbulators are clearly labeled for easy identification. Install these tubes in the position indicated on the label, at the vent end of the system.

9.1 SPECIAL COUPLING: 160,000 Btuh Model

NOTE: The joint of 1ST & 2ND tubes of 160,000 Btuh heaters experiences strong forces of expansion. Follow instructions below for special coupling of the tubes.

- **160,000 Btuh MUST USE 20 FT PRIMARY TUBE KIT TK-P160-UL**
- **DO NOT USE THE PRIMARY TUBE KIT DESIGNED FOR LESSER INPUTS**
- Follow instructions below for Special Coupling of the 1st & 2nd tubes.

TOOLS REQUIRED

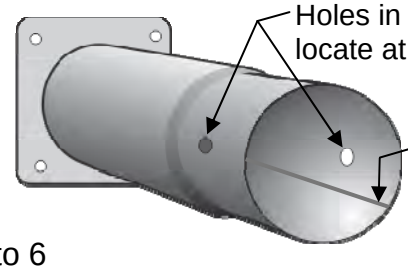
✔ Screw driver or similar tool with a shaft to aid in alignment of rivet holes in tubes

SPECIAL COUPLER INSTALLATION

1. Note the 2 holes opposite each other at the swaged end of the first tube (flanged)
2. Install the **first tube** with 2 holes (swaged end) at the 3 and 9 o'clock position, with the **welded seam located in the lower half of tube, facing downward**
3. Slide the loosened tube coupler on to the first tube, past the swage
4. The second tube has a ¼" hole at the female end.
5. Slide second tube over swaged end of first tube to align the hole in the second tube with one of the holes in the first tube
6. Final alignment of the holes can be accomplished using a screw driver or other tool
7. **IMPORTANT:** Insert ¼" rivet into the hole to secure the tube connection
8. Slide coupler into position – half onto each tube – covering the rivet head
9. Tighten coupler bolts to 40 ft-lb
10. Install reflectors - return to installation instructions Section 9

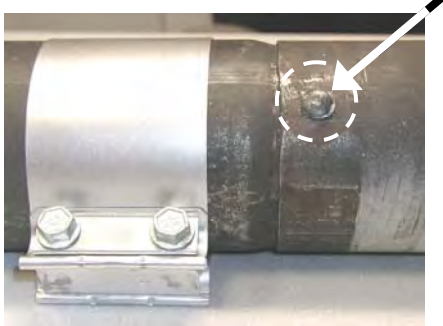
FIGURE 16 SPECIAL COUPLING: 160,000 Btuh - Connect 2nd Tube to 1st Tube -

Steps 1 & 2

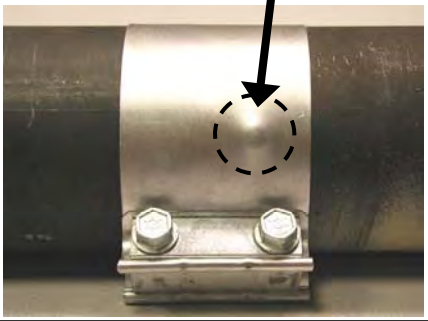


Steps 3 to 6

Step 7



Steps 8 & 9



9.2 SPECIAL COUPLING: 200,000 Btuh ULTRA Model

NOTE: The FIRST TWO tube connections (tube 1 to 2 and tube 2 to 3) experience strong forces of expansion. Tubes 1, 2, and 3 have pre-drilled holes in sidewall.

- **200,000 Btuh MUST USE: 20 ft PRIMARY TUBE KIT TK-P200-UL *or***
  30 ft PRIMARY TUBE KIT TK-P230-UL
- **DO NOT USE ANY PRIMARY TUBE KIT DESIGNED FOR LESSER INPUTS**

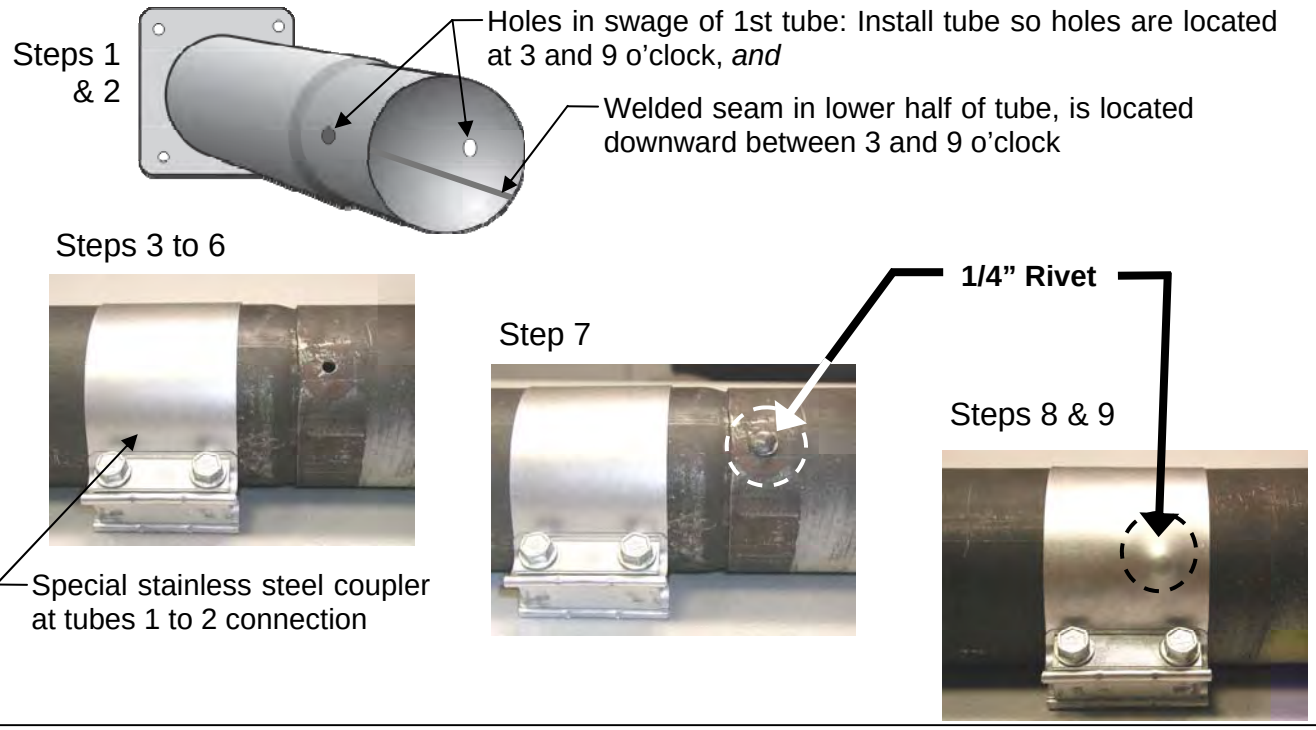
TOOLS REQUIRED

- Screw driver or similar tool with a shaft to aid in alignment of rivet holes in tubes

COUPLER INSTALLATION *A SPECIAL STAINLESS STEEL COUPLER IS FOR 1ST CONNECTION*

1. Note the 2 holes opposite each other in the sidewall of the swaged end of the first tube (flanged)
2. Install the **first tube** with 2 holes (swaged end) at the 3 and 9 o'clock position, with the **welded seam located in the lower half of tube, facing downward**
3. **The connection between tube 1 and 2 uses a special stainless steel coupler**. Slide the loosened tube coupler on to the first tube, past the swage
4. The second and third tubes have a ¼" hole in the sidewall at the female end.
5. Slide second tube (stainless steel) over swaged end of first tube to align the hole in the second tube with one of the holes in the first tube
6. Final alignment of the holes can be accomplished using a screw driver or other tool
7. **IMPORTANT:** Insert ¼" rivet into the aligned holes to secure the tube connection
8. Slide coupler (stainless steel at 1st joint) into position – half onto each tube – covering the rivet
9. Tighten coupler bolts to 40 ft-lb
10. Repeat steps 3 through 9 to install the 3rd tube (painted with sidewall hole) to the 2nd tube
11. Install reflectors - return to installation instructions Section 9

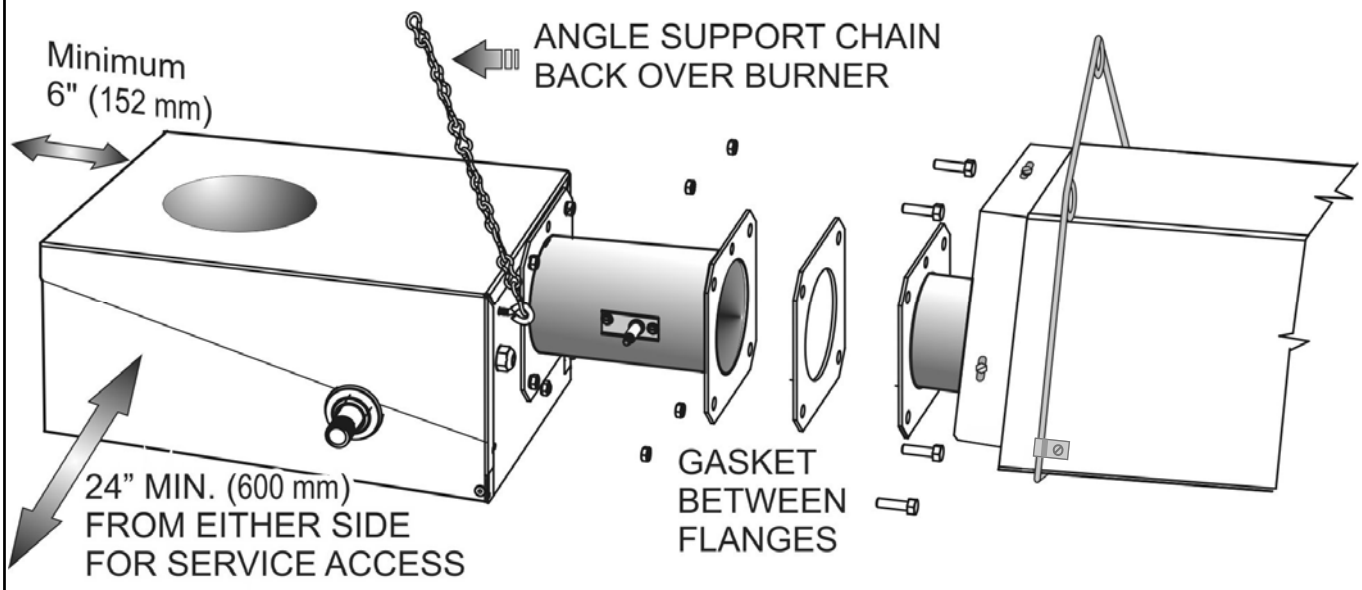
FIGURE 16 SPECIAL COUPLING: 200,000 Btuh - Connect 1st, 2nd & 3rd Tubes -


Steps 1 & 2
Holes in swage of 1st tube: Install tube so holes are located at 3 and 9 o'clock, *and*
Welded seam in lower half of tube, is located downward between 3 and 9 o'clock
Steps 3 to 6
Special stainless steel coupler at tubes 1 to 2 connection
Step 7
1/4" Rivet
Steps 8 & 9

10. INSTALLATION OF BURNER TO THE TUBE SYSTEM

1) Ensure that there is minimum service clearance of 6 inches (15 cm) from the access end of the burner and minimum 24 inches (60 cm) from either side to a wall or other obstruction (see Section 6A : Service Clearance)
2) The gasket supplied is installed between the burner and tube flanges
3) Position the gasket and secure the burner to the first tube flange using the four nuts and bolts provided (FIG 14)
4) ENSURE THAT THE BURNER AND TUBE FLANGES ARE IN ALIGNMENT
5) Tighten the bolts in an opposite corner sequence
4) NOTE: The 'center of gravity' of the burner is slightly off-center to that of the tube system. To prevent rotation of the burner:
   - ⇨ Install a support chain from the burner eye hook to a point approximately 6 to 10 inches (15 to 25 cm) back over the burner away from the first tube hanger - this configuration of the support chain allows "straight back" movement of the burner during expansion of the system
   - ⇨ **DO NOT** fasten chain from the burner eye hook to the first hanger suspension point

FIGURE 14 BOLT BURNER TO FLANGED TUBE



PROVIDE ACCESS FOR SERVICE OR REPAIR TO BURNER: MINIMUM 6 INCHES (15 CM) FROM THE ACCESS END AND A MINIMUM OF 24 INCHES (60 CM) FROM EITHER SIDE TO A WALL OR ANY OBSTRUCTION.

(SEE SECTION 6: PRE-INSTALLATION SURVEY AND MOUNTING CLEARANCES*)*

WARNING

11. FLUE VENTING

Inadequate venting of a heater may result in asphyxiation, carbon monoxide poisoning, injury or death. This heater may be directly or indirectly vented from the space. Seal all direct vent connections with high temperature sealant. Venting must be in accordance with all local, state, provincial, and national codes (ANSI Z223.1/NFPA 54 in USA; B149.1 in Canada) and as indicated in this manual.

THIS TUBE HEATER IS APPROVED FOR VENTING DIRECTLY TO THE OUTSIDE AND UNVENTED (INDIRECT VENTING) APPLICATIONS. THE SYSTEM MUST NOT BE OPERATED WITHIN A NEGATIVE AIR CONDITION UNLESS COMBUSTION AIR IS DUCTED FROM OUTSIDE DIRECTLY TO THE BURNER.

IF NEGATIVE PRESSURE IS EXPERIENCED OR ANTICIPATED, THE SECOND PORT (BARB) ON THE BLOCKED FLUE SWITCH SHOULD BE CONNECTED DIRECTLY TO OUTSIDE AIR USING 1/4" PLASTIC HOSE FROM BLOCKED FLUE SWITCH TO OUTSIDE OF BUILDING (FIELD SUPPLIED).

UNVENTED (INDIRECT MECHANICAL VENTING SYSTEM)

Indirect venting must not be used if the building experiences a negative air condition. A minimum 10 inch (25 cm) length of single walled vent pipe is to be installed on the swaged end of the last tube before any Tee, Elbow or Termination Cap is fitted.

USA: Heater indirectly vented: Natural or mechanical means shall be provided to supply and exhaust at least $4ft^3$/min/1000Btuh ($0.38m^3$/min/kW) input of installed heaters. Some local codes may require an electrical interlock to a dedicated exhaust fan. Exhaust must be located as high as practicable in the structure above the level of the heater(s). Consult your local code and ANSI Z223.1 latest edition for all venting requirements and practices.

Canada: Heater indirectly vented: It is required that the heater(s) be electrically interlocked to dedicated exhaust fan(s) by means of an Air Proving Switch. Exhaust fan(s) must be sized to create 300 cfm (8.5 cu m/min) exhaust for every 100,000 Btuh (30 kW) or any fraction thereof of total input of installed equipment. Exhaust must be located as high as practicable in the structure above the level of the heater(s). Sufficient supply air must be provided. Consult CSA.B149.1 latest edition for requirements.

VENTED DIRECTLY TO THE OUTSIDE - refer to Section 11A for vent lengths

It is the sole responsibility of the installer to adhere to all current local codes and/or ANSI Z223.1 / CSA.B149.1 latest editions for all venting requirements, and practices.

It is a normal condition that during heat-up and cool-down a tube heater will expand and contract. *Allowances for heater expansion must be made in the venting and combustion air ducting*. Improper installation can result in property damage, injury or death.

- All venting must be minimum 26 gauge single wall vent pipe of 4" (10 cm) diameter except that portion of vent passing through a combustible wall or roof can be 4" type "B" vent as per CSA International's interim requirement. Refer to Section 11A for vent length requirements.
- As an Option, two heaters may be vented through an approved common 4" x 4" x 6" Vent Tee (10 x 10 x 15 cm), supplied by the manufacturer, and 6" diameter vent pipe. The two heaters must then be controlled by a single common thermostat or "ON/OFF" switch.
- All vent pipe and adapters are supplied locally by others

- Install a minimum 36 inch (91 cm) length of minimum 26 gauge single walled 4” (10 cm) diameter vent pipe at the end of the tube system, and a minimum 12 inch (30 cm) length prior to fitting any Tee or Elbow
- Seal all vent connections with high temperature sealant. Vent connections must be mechanically secured with three (3) #8 sheet metal screws uniformly spaced around the circumference of the vent pipe
- When the vent pipe passes through a cold or unheated area where the ambient temperature is likely to produce condensation of the flue gases. The vent pipe shall be insulated with a suitable material as approved and specified by the insulation manufacturer to withstand temperature up to 460°F (238°C)
- The vent system must always be adequately supported to prevent sagging

FIGURE 15 - Heater Expansion - Vent Configuration

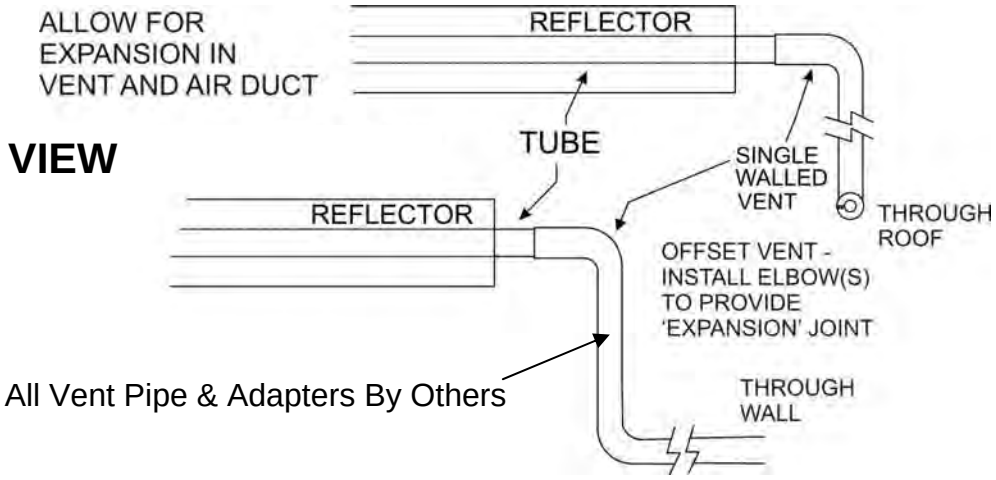
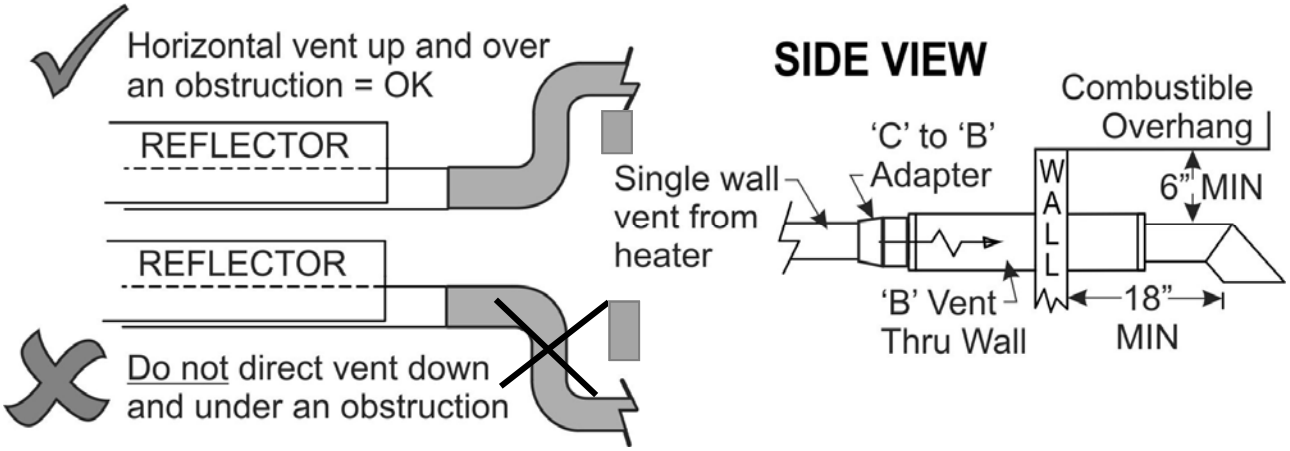


FIGURE 16 - Horizontal Vent - ALL vent pipe and adapters by others



Clearances apply to Vent Terminal: 4” (10 cm) - JA-0528-XX Or 6” (15 cm) - JA-0529-XX

See notes below for use of other approved vent terminations

HORIZONTAL VENT THROUGH THE SIDEWALL:

- The flue vent system must slope downwards approximately 1/4" per ft (63 mm/ 300 mm) toward the vent terminal, starting at the termination of the radiant tube - radiant tube must be level.

- Use approved 4" (10 cm) (JA-0528-XX) or 6" (15 cm) (JA-0529-XX) horizontal wall vent terminal or a high-wind termination cap approved by a recognized certification agency
- Install termination cap a minimum of 18 inches (45 cm) from the outside wall to the inside edge of terminal opening to alleviate back pressure caused by turbulent wind conditions (See Fig. 16). Ensure flue gases are directed away from the structure to protect building materials from degradation by the exhausted flue gases
- At most two 90° elbows can be installed in a horizontal vent , and 3 in a vertical vent
- Each 90° elbow is equivalent to 5 ft of system length
- Installation of the vent must prevent blockage by snow and protect building materials from degradation by flue gases

A horizontal flue vent :

- Will not terminate less than 1 ft (30 cm) above grade level, unless its location is adjacent to public walkways, then it must not terminate less than 7 ft (2.1m) above the walkway.
- Will terminate 3 ft (90 cm) or more below or extend beyond a combustible soffit or overhang.

USA specific horizontal vent requirements:

- The vent terminal of a direct-vent appliance with an input between 10,000 Btu/hr (3 kW) and 50,000 Btu/hr (14.7kW) shall be installed with a 9 inch (230mm) vent termination clearance from any air opening into a building, and an appliance with an input over 50,000 Btu/hr (14.7kW) shall have at least a 12inch (300mm) vent termination clearance. The bottom of the vent terminal and the air intake shall be located at least 12inches (300mm) above grade.
- A horizontal vent will not terminate:
    - Less than 3 ft (90 cm) above a mechanical air inlet located within 10 ft (3.1 m)
    - Less than 4 ft (1.2 m) below, 4 ft (1.2 m) horizontally from, and 1 ft (0.3 m) above any window or door that opens, or gravity air inlet to a building
    - Less than 4 ft (1.2 m) horizontal clearance from gas and electric meters, regulators and relief equipment

CANADA specific horizontal vent requirements:

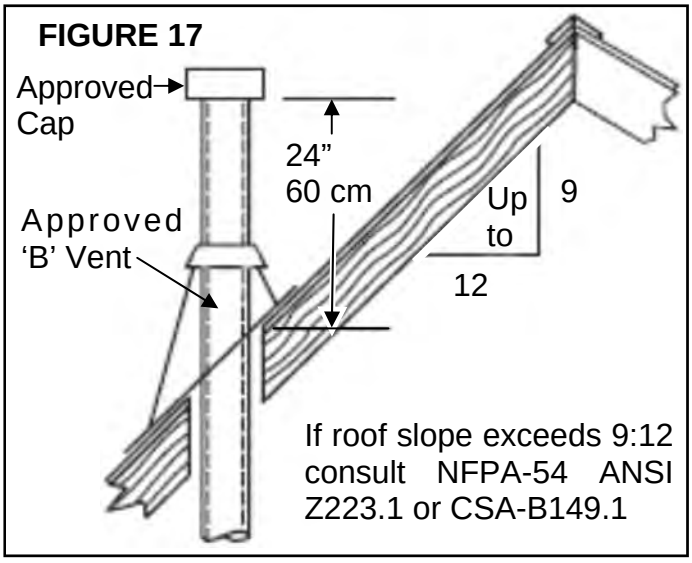
- A horizontal vent will not terminate:
    - Within 6 ft (1.8 m) of a mechanical air supply inlet to any building.
    - Above a gas utility meter and regulator assembly within 3 ft (0.9 m) horizontally of the vertical centerline of the regulator vent outlet to a maximum vertical distance of 15 ft (4.5 m).
    - Within 3 ft (90 cm) of any gas pressure regulator vent outlet
    - Within the following distances of a window or door that can be opened in any building, of any non-mechanical air-supply inlet to any building, or of the combustion air inlet of any other appliance:
        - 12 inches (30 cm) for inputs up to and including 100,000 Btuh (30 kW)
        - 3 ft (90 cm) for inputs exceeding 100,000 Btuh (30 kW)

VERTICAL VENT THROUGH THE ROOF:

It is the sole responsibility of the installer to adhere to all current local codes and/or ANSI Z223.1 / CSA.B149.1 latest editions for all venting requirements, and practices.

- Use an approved 'B-vent' termination cap as supplied by the manufacturer of the approved 'B-vent'.
- When vent and combustion air are taken through the roof, the exhaust vent should always terminate higher than the combustion air intake, to prevent recycling the products of combustion back into the heater

FIGURE 17



- At most a quantity of three 90° elbows can be installed in a vertical vent

11A. Combined System Length: Tube Heater + Vent + Combustion Air Duct:

MINIMUM VENT LENGTH: (Vented or Unvented [indirect mechanical ventilation])

- Minimum vent length of 3 ft (91 cm) is required

MAXIMUM SYSTEM LENGTH (includes: Tube Heater length + combustion air duct + vent**)**:

- Each 90° elbow in the system has an equivalent length of 5 ft.
- A maximum of 2 elbows are allowed in any portion (duct, tube heater, vent) with the exception of up to three 90° elbows in a vertical vent run through the roof
- Combustion air duct may be 4" or 5" diameter and is not to exceed lengths in table below
- Exceeding the allowable lengths in the table below can create combustion and/or condensation problems and will void CSA Certification and the heater warranty.
- Do not exceed the Maximum Combined System Length regardless of the allowed maximum length of individual vent or combustion air duct

Input (Btuh)	Do Not Exceed Maximum Combined System Length		Max. Air Duct Length (ft) (by Duct Diameter)	Max. Vent Length (ft)
	4" Air Duct	5" Air Duct	4"Ø / 5"Ø	Individual: 4"Ø Combined: 6"Ø
60,000	**60 ft**	**80 ft**	30 / 50	30
90,000	**80 ft**	**100 ft**	30 / 50	40
130,000	**100 ft**	**120 ft**	30 / 50	40
160,000	**100 ft**	**120 ft**	30 / 50	40
200,000	**120 ft**	**140 ft**	30 / 50	50

Example	
160,000 Btuh Heater:	
Tube Heater Length	50 ft
1 x 90° elbow (vent)	5 ft
Straight vent	20 ft
1 x 90° elbow (duct)	5 ft
Air Duct: 4" Ø	17 ft
Combined Length	97 ft
Max. Allowed	100 ft
Additional 20' for 5" Ø Air Duct	

12. COMBUSTION AIR DUCTING

An opening is located on the top surface of the burner housing for combustion air . Ensure adequate clearance around this opening to allow sufficient combustion air supply to the heater.

When a tube heater is operated in a negative air condition or air-born dust or contaminants are present as in woodworking and welding shops, air for combustion must be ducted from outside the negative or contaminated area to the 4 inch (10 cm) diameter intake flange supplied on the blower. Maximum vent, duct, and total system lengths are listed in the Table previous page.

- **A maximum of 30 feet of outside air duct is allowed on any system**
- Total combined system length is reduced by five feet for every 90° elbow installed in the vent or duct *and* in the tube system (see above for allowable total lengths)
- Exceeding the allowable lengths noted above may create condensation problems and will void CSA Design Certification and product warranty.

The air intake will not be located less than:

- Three feet above grade
- Twelve inches from flue vent terminal of any heater with input up to 100,000 Btu/hr.
- Three feet from flue vent terminal of any heater over 100,000 Btu/hr.

Do not install filters on the combustion air intake.

Ensure adequate clearance around the air intake to allow sufficient combustion air supply to the heater.

This heater has an optional fresh air intake duct hood for wall (JS-0532-VC) or roof cap (JS-0530-XX) to bring combustion air to the heater from outside. Ensure adequate clearance around the air intake to allow sufficient combustion air supply to the heater. If drawing fresh air from outside, it is recommended that any single wall pipe containing cold air be insulated to prevent or reduce condensation on the pipe.

Do not use flexible dryer hose or any 'soft wall' tubing for air inlet duct, the corrugated sides of this tubing restrict air flow. A good quality industry approved insulated flex is allowed.

In locations where chlorinated Hydrocarbons are in use, such as Trichloroethylene or Chloroethylene Nu it is essential that combustion air be brought in from a non-contaminated area. Burning the fumes from these gases will create Hydrochloric acid fumes, which are detrimental to humans, equipment and buildings. Typical sources of other contaminants are paint removers, paints, refrigerants, solvents, adhesives, degreasers, lubricants, pesticides, etc.

The heater manufacturer cannot anticipate all types and chemical composition of possible contaminants at project sites. Confer with project site safety, health and engineering staff and/or local authorities having jurisdiction such as the Fire Marshall and/or Department of Labor for the nature of possible contaminants and any conflict that can arise with the installation of hot surface heating equipment.

13. GAS SUPPLY - HEATER EXPANSION - FLEXIBLE GAS CONNECTION

The gas supply must be installed to the heater using:

- **In the USA**: an approved Stainless Steel Flexible Gas Connector certified for use on an infrared radiant tube heater (ANSI Z21.24 CSA 6.10);
- **In CANADA**: an approved Type 1 Hose Connector (CAN/CGA 8.1).

- The heater must be isolated from the gas supply piping system by closing its individual manual shut off valve (field supplied) during any pressure testing of the gas supply piping system.

CAUTION: Compensation for normal gas supply pipe expansion, and radiant tube heater expansion must be provided. All piping must conform to local codes— Refer to Heater Expansion & Flexible Gas Connection—Sections 14 next two pages

Provide a 1/8 in (3.2 mm) NPT plugged tapping, accessible for test gauge connection, immediately upstream of the gas supply connection to the heater.

DO NOT use pressure greater than 1/2 psig to pressure check the heater.

TEST FOR LEAKS: All gas piping and connections must be tested for leaks after the installation is completed.

Apply soap suds solution to all connections and joints and if bubbles appear, leaks have been detected and must be corrected. **DO NOT USE A MATCH OR OPEN FLAME OF ANY KIND TO TEST FOR LEAKS. NEVER OPERATE THE HEATER WITH LEAKING CONNECTIONS.**

The supply system should be checked first with heater turned “OFF” followed by another check with heater turned “ON”.

IMPORTANT: Minimum supply line pressure at the inlet to the heater regulator must not be lower than 5.0 inches of water column pressure for natural gas. The supply gas pressure must be checked with all heaters in operation.

Installation of a gas line (trap) “drip leg” is required at the inlet connection tee following the pipe drop to the heater. Failure to provide a “drip leg” could result in condensation and foreign matter passing into the gas valve. Failure to install a “drip leg” in the gas line can cause property damage, injury or death and will void the heater warranty.

TABLE 5

GAS TYPE	LINE PRESSURE Inches Water Column (millibars)		MANIFOLD PRESSURE (tap at gas valve outlet) Inches Water Column (millibars)
	MINIMUM	MAXIMUM	
Natural Gas	5.0 (12.46)	14.0 (34.87)	3.5 (8.72)

NOTE: Access to the manifold pressure test port is on the top of the valve. A 3/16" Allen Wrench is necessary to check this. When checking or setting the manifold pressure, a **water manometer** should be used. Gauges which measure in ounces per square inch or pounds per square inch are not accurate enough to properly measure or set the pressure.

WARNING

THIS HEATER WILL EXPAND IN LENGTH AS IT HEATS UP. It is a normal condition that during heat-up and cool-down a tube heater will expand and contract. Allowances for heater expansion must be made in the gas connection, venting and combustion air ducting. Improper installation, alteration, or adjustment can result in property damage, injury or death. **See also Section 13**

The Btuh input and the tube length determine the overall expansion that occurs. A typical infrared tube installation will expand toward both the Burner and the vent end.

To allow heater expansion the gas supply must be installed using:

In the USA: a stainless steel Flexible Gas Connector certified for use on an infrared radiant tube heater (ANSI Z21.24 CSA 6.10);

in CANADA: a Type 1 Hose Connector (CAN/CGA 8.1). Also the flue vent, and combustion air intake (if used) must be installed in such a manner that the normal expansion of the heater will be accommodated.

IMPORTANT:
See FIG 18 next page: orientation of connection between heater and gas supply.

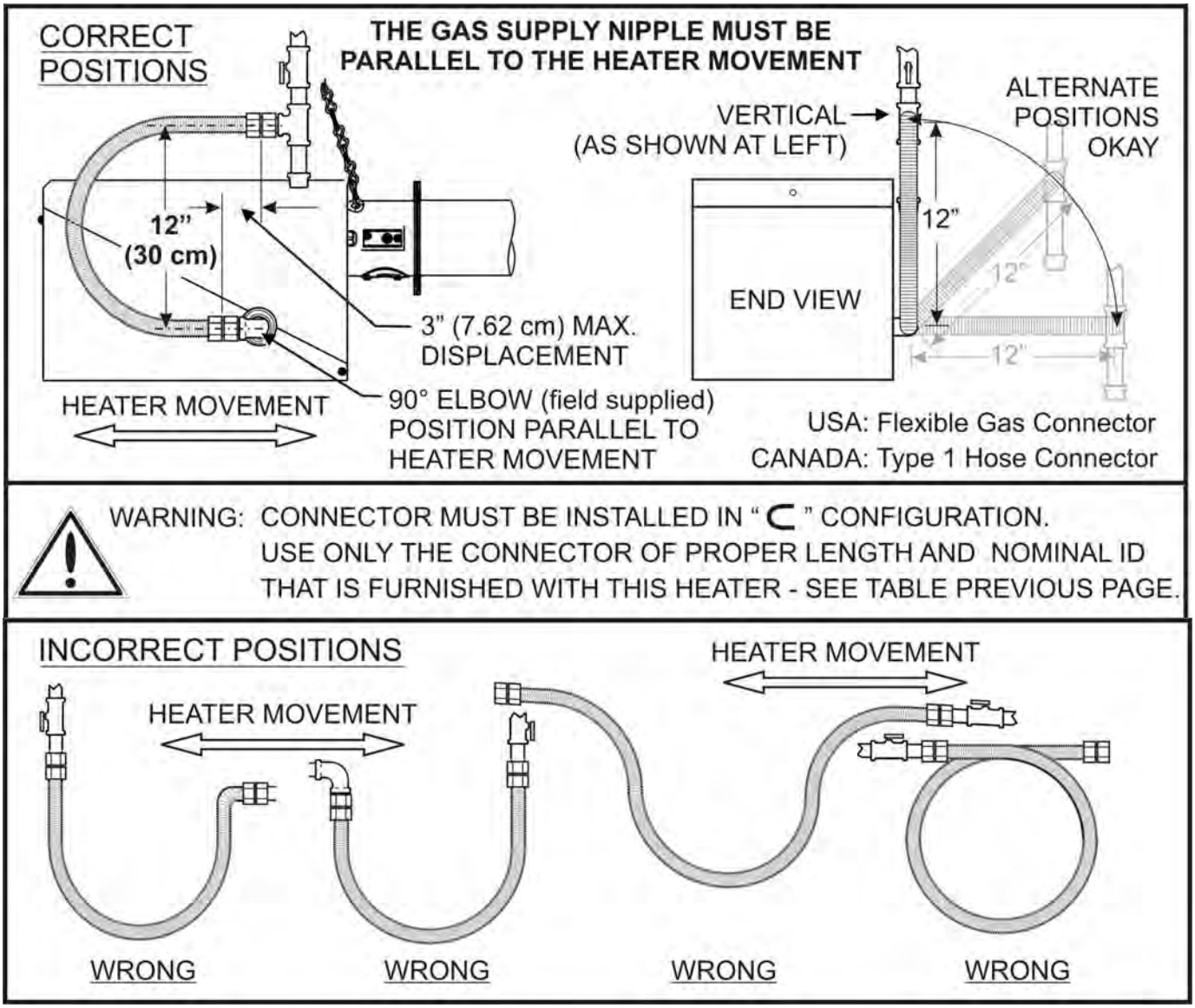
TABLE 6

Input Rating Btuh	Tube Length Feet	Approx. Expansion in Length	USA: Mandatory Flexible Gas Connector ID x Length - Part #	CANADA: Mandatory Type '1' Gas Hose Size - Part #
60,000	20 / 30	1 1/2"	1/2" x 24" - JL-0771-XX	1/2" x 36" - JL-0771-RC
90,000	30 / 40	1 3/4"	1/2" x 24" - JL-0771-XX	1/2" x 36" - JL-0771-RC
130,000	40 / 50	2"	1/2" x 24" - JL-0771-XX	3/4" x 36" - JL-0771-RB
160,000	50 / 60	2 1/2"	3/4" x 36" - JL-0771-YY	3/4" x 36" - JL-0771-RB
200,000	60 / 70	3 1/4"	3/4" x 36" - JL-0771-YY	3/4" x 36" - JL-0771-RB

FIGURE 18 ORIENTATION OF FLEXIBLE GAS CONNECTOR

The flexible gas connector MUST be installed in the orientation shown below as required by national installation codes and by the certification standard of this heater. This orientation protects the flexible gas connector from damage due to movement during heater expansion.

It is the responsibility of the installer to ensure correct installation of the flexible gas supply.


CORRECT POSITIONS
THE GAS SUPPLY NIPPLE MUST BE PARALLEL TO THE HEATER MOVEMENT
VERTICAL (AS SHOWN AT LEFT)
ALTERNATE POSITIONS OKAY
12" (30 cm)
3" (7.62 cm) MAX. DISPLACEMENT
END VIEW
12"
12"
12"
HEATER MOVEMENT
90° ELBOW (field supplied) POSITION PARALLEL TO HEATER MOVEMENT
USA: Flexible Gas Connector
CANADA: Type 1 Hose Connector
WARNING: CONNECTOR MUST BE INSTALLED IN " ⊂ " CONFIGURATION.
USE ONLY THE CONNECTOR OF PROPER LENGTH AND NOMINAL ID
THAT IS FURNISHED WITH THIS HEATER - SEE TABLE PREVIOUS PAGE.
INCORRECT POSITIONS
HEATER MOVEMENT
HEATER MOVEMENT
WRONG
WRONG
WRONG
WRONG

The flue vent, and combustion air duct (if installed) must also be configured in such a manner that the normal expansion of the heater will be accommodated. **See Section 11.**

14. ELECTRICAL AND THERMOSTAT WIRING (WIRING DIAGRAMS PAGES 31 & 32)

NOTICE

The heater must be electrically grounded in accordance with the National Electrical Code. ANSI / NFPA 70 or current Canadian Electrical code CSA C22.1.

Appliance and control wiring must be in accordance with all applicable local codes. The total load of all heaters must be considered in determining the required contact rating of the controlling thermostat or switch. Each tube heater requires 120V, 60 HZ electrical power sized for 145VA. Maximum power flow for internal 24V burner components is 21VA.

The ignition control includes a 24V/120V relay switch that provides a 45 second post-purge of the system. **A 24V Thermostat, TruTemp Thermostat, or 24V controller signal must be used for the post-purge feature to function.** A line voltage Thermostat or an "ON/OFF" switch will disable the post-purge feature.

A maximum night set-back of 9°F (5°C) is recommended for optimum economy and comfort. To maintain satisfactory comfort levels do not turn off the heating system over night/weekends.

15. HIGH ALTITUDE INSTALLATIONS - *Refer to chart in Section 28 for Restrictions*

When installed above the altitude stipulated below, the input must be de-rated by 4% for each 1000 ft above the altitude listed. Refer to the chart in Section 28 for orifice size and restrictions that apply to high altitude installation. Check with your local utility regarding the gas supply and the de-rating of this appliance. Maintain gas supply pressure indicated in Table 4, page 33.

Installations above 4,000 ft: Restrict the length of any model to the shortest tube length.

USA: The factory installed orifice for this appliance is approved for altitudes zero to 2000 feet above sea level. When installed above 2000 feet, **refer to Section 28**.

Canada: The factory installed orifice for this appliance is approved for altitudes zero to 4500 feet above sea level. When installed above 4500 feet, **refer to Section 28**.

16. LIGHTING INSTRUCTIONS

Refer to the lighting instructions label on the outside of the burner housing. If the unit locks out on safety, main power to the unit must be manually interrupted for a 30 second reset period before the heater can be restarted.

NOTE: ***On initial installation, the unit may lock out on safety owing to the length of time required to bleed air from the gas piping system.***

17. RECOMMENDED MAINTENANCE

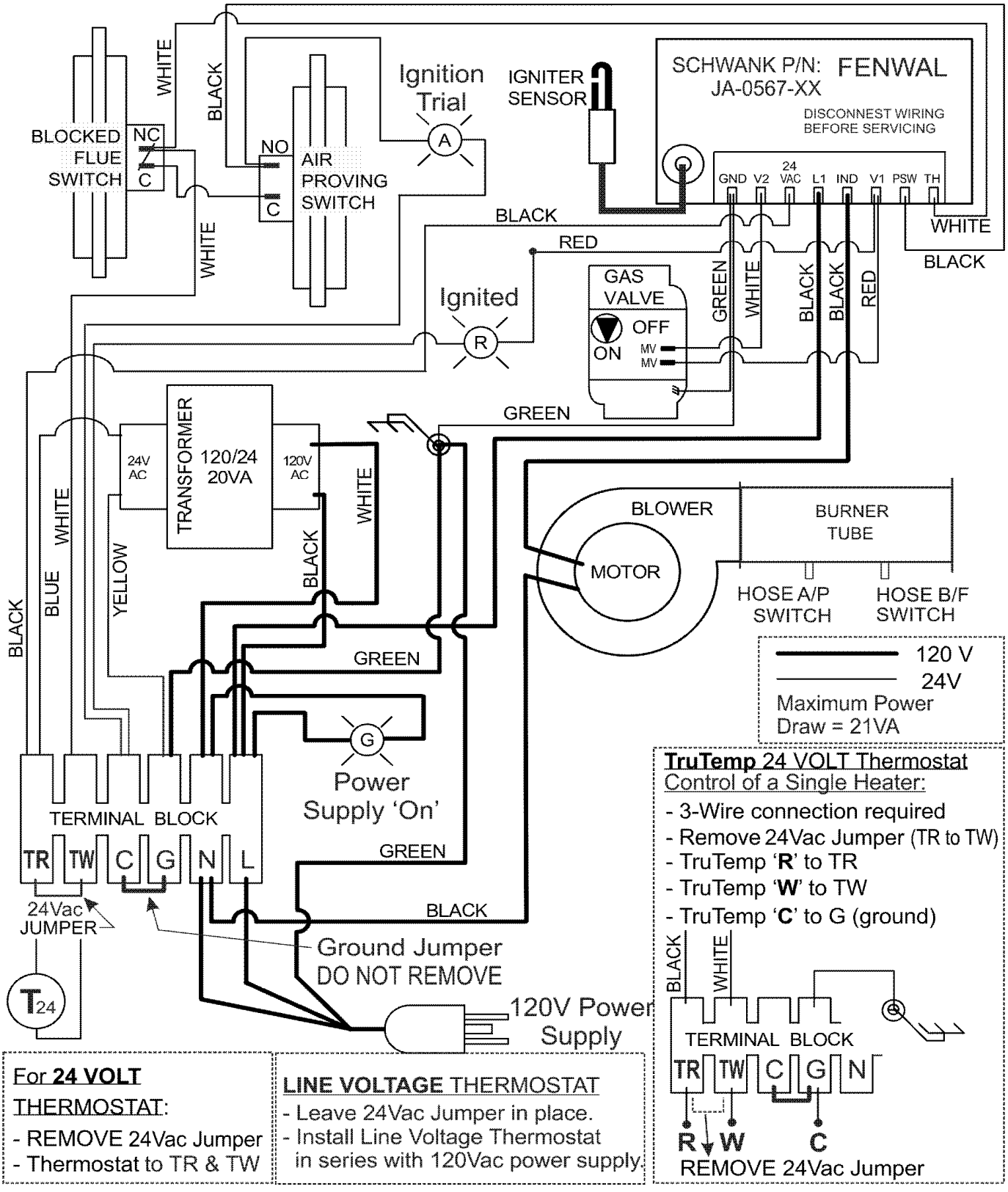
Improper adjustment, alteration, service or maintenance can cause property damage, injury or death. This heater must be installed and serviced only by a trained gas service technician.

1. Inspect the entire heater system, venting, and gas supply connections at least annually prior to the heating season. Replace worn parts and repair deficiencies.
2. Check the inlet air opening and the blower periodically, cleaning off any lint or foreign matter. It is important that the flow of combustion and ventilation air must not be obstructed.
3. Lubricate Blower motor, by adding several drops of oil to oil ports located on the left hand side of the motor.

THE TUBE HEATER BURNER IS COMPLETELY FACTORY ASSEMBLED AND TESTED. ANY ALTERATION VOIDS THE CSA CERTIFICATION AND MANUFACTURER'S WARRANTY. FOR ADDITIONAL INFORMATION, CONTACT YOUR LOCAL DISTRIBUTOR OR THE MANUFACTURER.

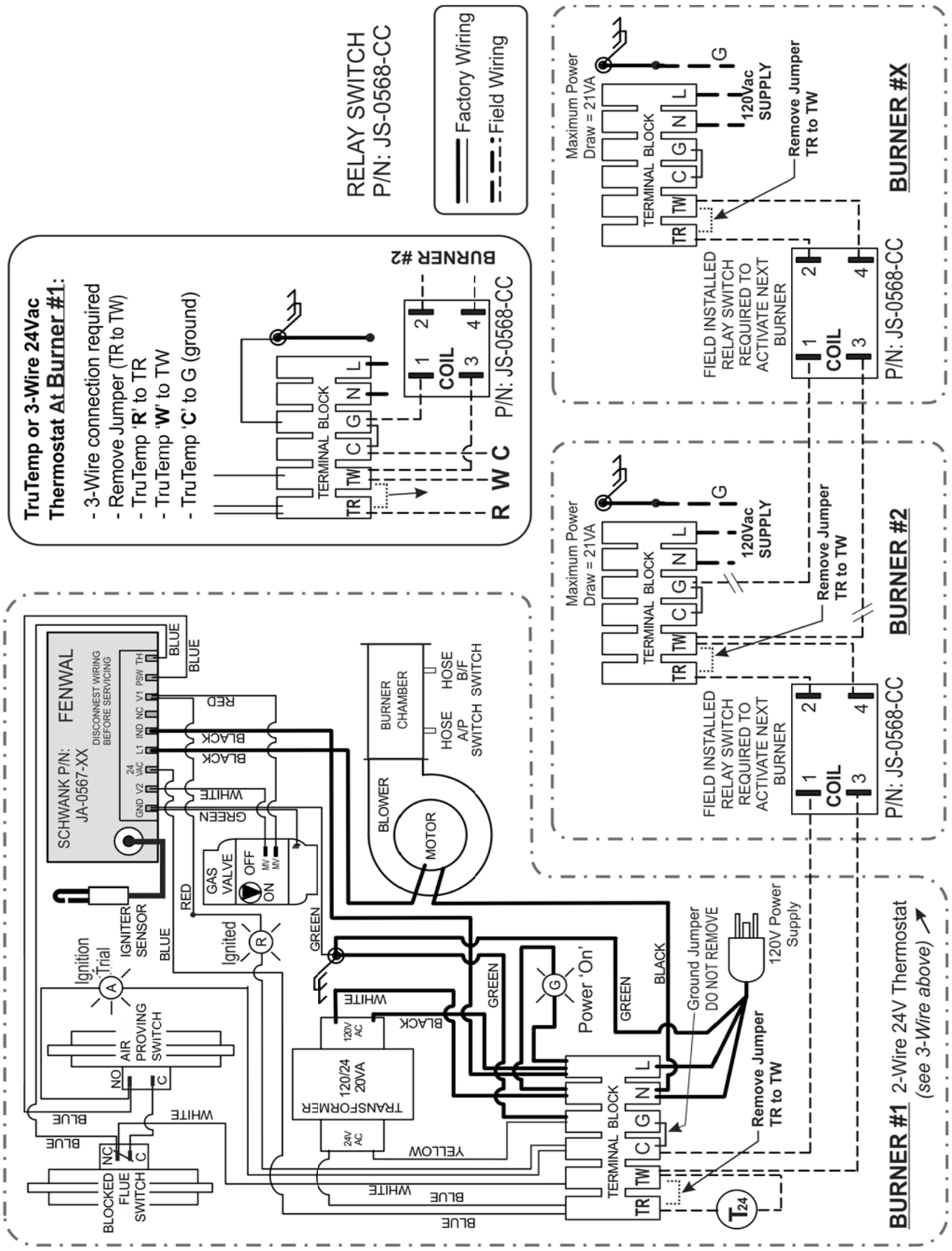
18. FENWAL DSI: WIRING DIAGRAM: 24V OR 120 VOLT THERMOSTAT OPERATION SINGLE HEATER PER THERMOSTAT *(Multiple Heaters per Thermostat—next page)*

*NOTE: Models produced with FENWAL DSI have model designation: S100-**F** & ITB-**F***



OTHER DSI's: HONEYWELL S87J - PAGES 52 - 53

19. MULTIPLE TUBE HEATERS per THERMOSTAT



20. FENWAL DSI: SEQUENCE OF OPERATION / FLAME RECOVERY / SAFETY LOCKOUT

Power Up / Stand By

Upon applying 24 volts power to 24VAC, the control will reset, perform a self check routine, initiate full time flame sensing, flash the diagnostic LED for up to four seconds, and enter the thermostat scan state.

Heat Mode

When a call for heat is received from the thermostat supplying 24 volts to TH, the control checks the pressure switch for normally open contacts. The combustion blower is then energized and once the pressure switch contacts close, a 30 second purge delay begins. Following the purge period the gas valve is energized and spark commences for the 15 second trial for ignition.

When flame is detected during the trial for ignition, spark is shutoff immediately and the gas valve combustion blower remains energized. The thermostat, pressure switch, and main burner flame are constantly monitored to assure the system continues to operate properly. When the thermostat is satisfied and the demand for heat ends, the main valve is de-energized immediately, the control senses the loss of flame signal and initiates a 30 second post-purge period before de-energizing the combustion blower.

Failure to Light - Lockout (THREE TRIAL MODEL)

This three-try control will attempt two additional ignition trials with a 30 second inter-purge between trials, before going into 'soft' lockout. The valve relay will be de-energized immediately, and the combustion blower will be turned off following the 30 second post purge period.

If the thermostat continues to call for heat after one hour the control will automatically reset and attempt to ignite the burner again (three trials).

At any time less than the 1 hour auto-reset, recovery from lockout requires a manual reset by either resetting the thermostat or removing 24 volts for a period of 5 seconds.

Flame Failure - Re-Ignition

If the established flame signal is lost while the burner is operating, the control will respond within 0.8 seconds. The HV spark will be energized for a trial ignition period in an attempt to relight the burner. If the burner does not light the control will de-energize the gas valve. Two more attempts will be made to relight the burner. If the burner does not relight the control will go into 'soft' lockout as noted above in "Failure to Light". If flame is re-established, normal operation resumes.

Combustion Airflow Problems -Lockout

Combustion air flow is continually monitored during an ignition sequence by the air flow switch (PSW). If during the initial call for heat the pressure contacts are in the closed position for 30 seconds without an output to the Combustion Blower, an air flow fault will be declared and the control will remain in this mode with the combustion blower off.

If the air flow switch remains open for more than 30 seconds after the combustion blower output (L1 & IND) is energized, an air flow fault will be declared and the control will stay in this mode with the combustion blower on, waiting for the air flow switch to close.

When proper air flow is detected from the air flow switch input (PSW) the control begins the pre-purge period followed with a 15 second ignition sequence.

If the air flow signal is lost while the burner is firing, the control will immediately de-energize the gas valve and the combustion blower will remain on. If the call for heat remains, the control will wait for proper air flow to return. If proper air flow is not detected after 30 seconds an air flow fault signal will be declared. If proper air flow is detected at any time, a normal sequence will begin with the pre-purge period.

Flame Fault

If at any time the main valve fails to close completely and maintains a flame, the full time flame sense circuit will detect it and energize the combustion blower. Should the main valve later close completely removing the flame signal, the combustion blower will power off following the optional post purge period.

Fault Conditions

The LED will flash on for 1/4 second, then off for 1/4 second during a fault condition. The pause between fault codes is 3 seconds.

Error Mode	LED Indication
Internal Control Failure	Steady on
Air Flow Fault	1 flash
Flame with No Call for heat	2 flashes
Ignition Lockout	3 flashes

MOUNTING AND WIRING

The Series 35-61 is not position sensitive and can be mounted vertically or horizontally. The case may be mounted on any surface with #6 sheet metal screws. All wiring must be done in accordance with local and national electrical code. Refer to wire diagram page 35 when connecting the Series 35-61 to other components in the burner.

WARNING

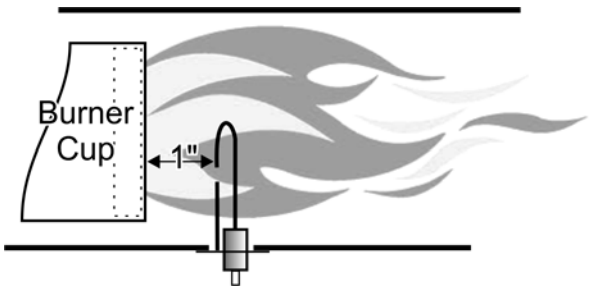
The Series 35-61 DSI Control uses voltages of shock hazard potential. Wiring and initial operation must be done by a qualified service technician. The control must be secured in an area that will experience a minimum of vibration and remain below the operating temperature of 160ºF. All connections should be made with UL approved 105ºC rated 18 gauge, stranded, .054 thick insulated wire. Refer to wire diagram page 35 when connecting the Series 35-61 to other components in the burner.

TERMINAL	SPADE	DESIGNATION
TH	1/4”	Thermostat Input
PSW	1/4”	Pressure Switch Input
V1	1/8”	Valve Power (MV)
IND	1/4”	Inducer Blower Output
NC	-	Alarm (Not used)
L1	1/4”	120/240 VAC Input (Hot)
24 VAC	1/4”	24 VAC Supply to Processor
V2	1/8”	Valve (MV)
GND	1/8”	Valve & System Ground
Spark	1/4”	Spark & Local Flame Sense

CAUTION:
Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. A functional checkout of a replacement control is recommended.

PROPER ELECTRODE LOCATION

Proper location of the electrode assembly is important for optimum system performance. The electrode assembly should be located so that the spark gap is inside the flame envelope about 1 inch (2.5 cm) from the base of the flame at the burner cup.



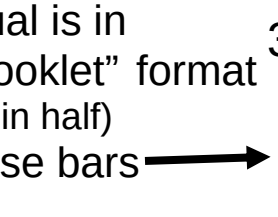
Electrodes should have a gap spacing of 3/16” (0.188” ± 0.031” or 4.76 mm ± 0.81 mm). If this spacing is not correct, the assembly must be adjusted or replaced. DO NOT adjust the curved igniter/sensor prong. Adjust/bend only the ground prong (also see next page).

SPARK IGNITER SET UP

Use the following diagram to check the Igniter gap. If the gap is incorrect all adjustments should be made to the **GROUND PRONG/PIN ONLY! DO NOT BEND THE IGNITER PRONG!!!!**

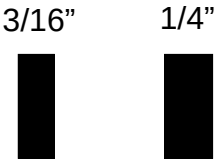
USE THE BLACK BARS BELOW AS A GUIDE FOR ADJUSTMENT. USE THE BARS THAT COINCIDE WITH THE FORMAT & SIZE OF THIS PUBLICATION .

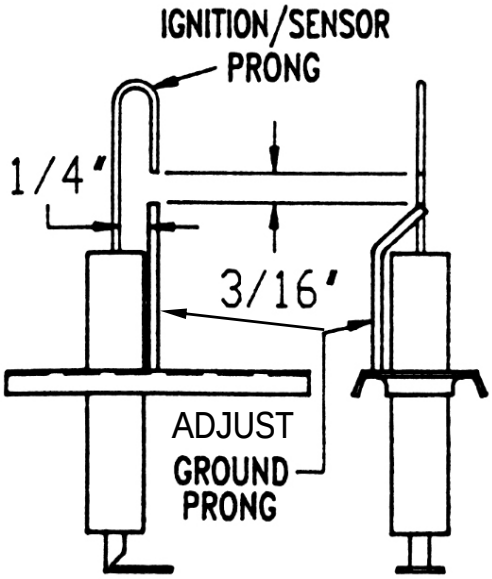
IF this manual is in **8.5" x 11"** "booklet" format (pages folded in half) then use these bars



OR

IF this manual is printed 8.5" x 11" "**full page**" format use these bars



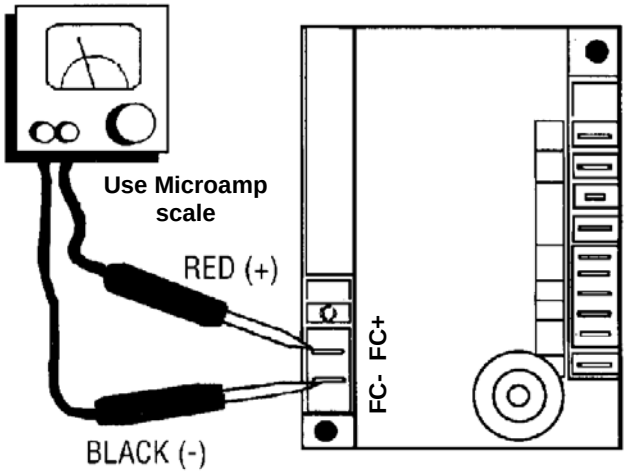


SERVICE CHECKS

Flame current passes through the flame from the sensor to ground. The minimum flame current necessary to keep the system from lockout is 0.7 microamps. To measure flame current, connect an analog DC microammeter to the FC- FC+ terminals per figure at right.

Meter should read 0.7 µA or higher. If the meter reads below "0" on scale, meter leads are reversed. Disconnect power and reconnect meter leads for proper polarity.

Multipurpose Meter



21. TROUBLESHOOTING GUIDE - FENWAL DSI

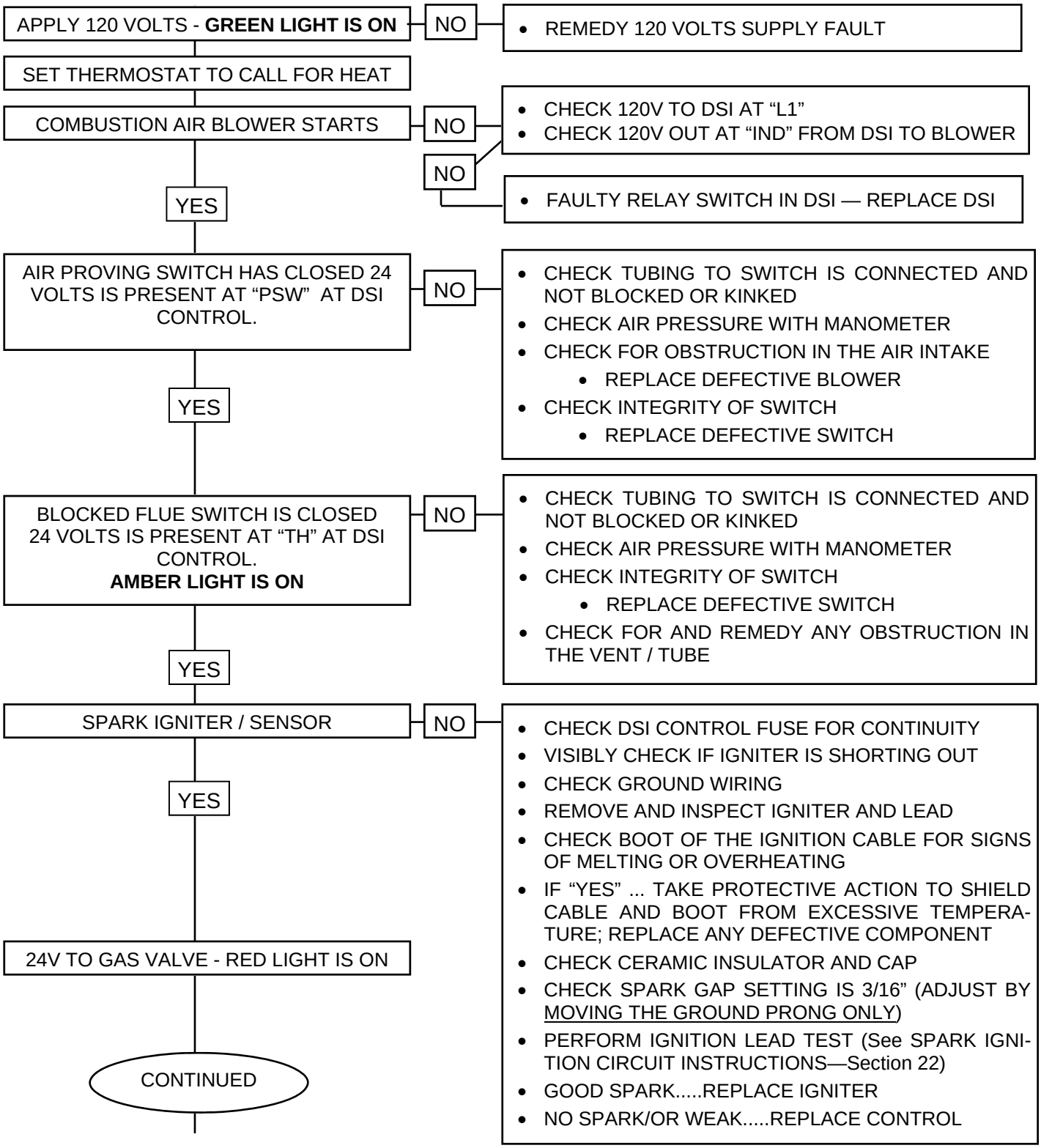
(also see Heater Troubleshooting next page)

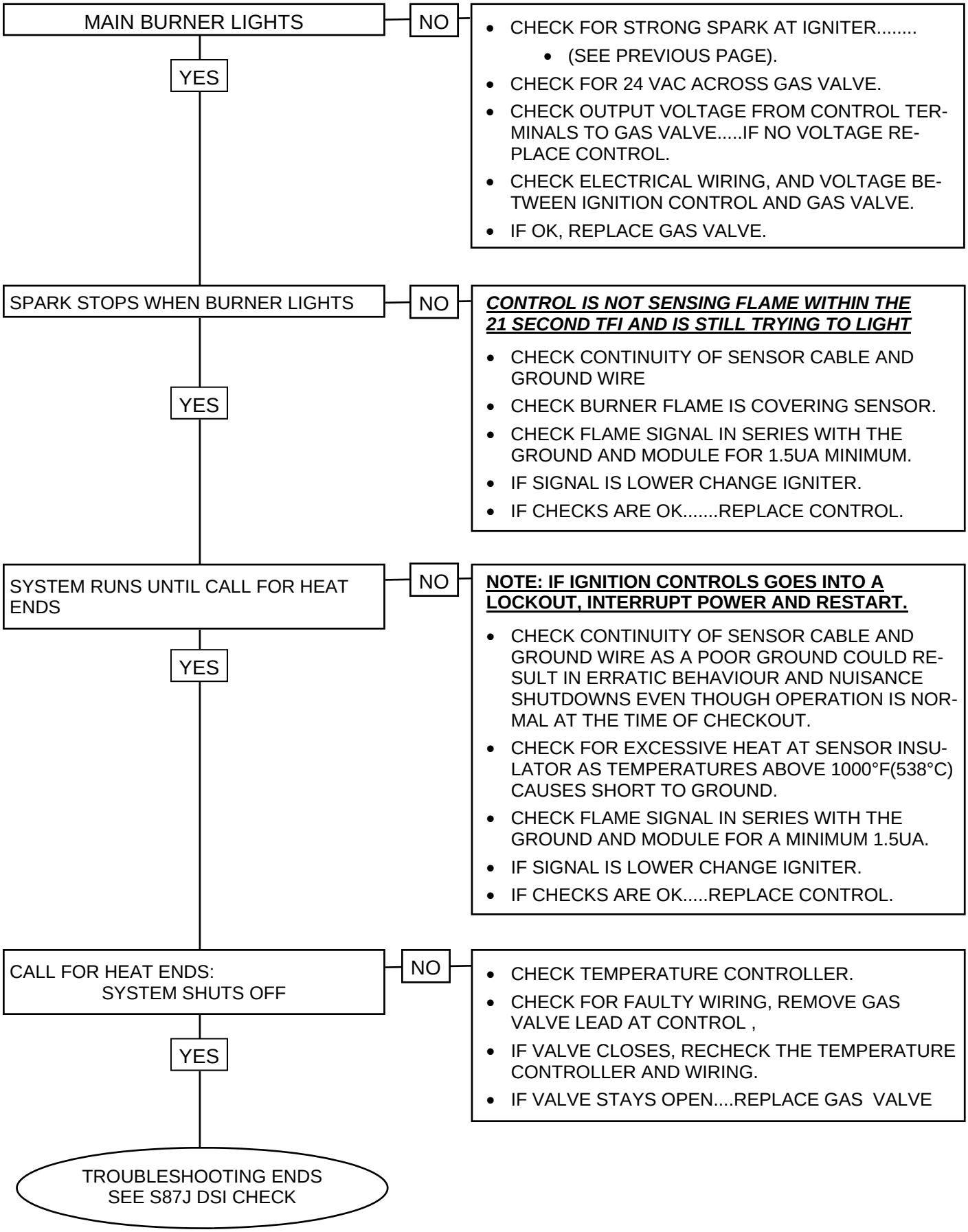
SYMPTOM	RECOMMENDED ACTION(S)
1. Dead	A. Miswired - check electrical supply (120Vac ± 5%) B. Transformer bad (24Vac ± 10%) C. Fuse/Circuit breaker bad D. Bad control (check LED for steady on)
2. Thermostat on - no blower output	A. Miswired B. Bad thermostat no voltage @ terminal W C. Bad control (check LED for steady on)
3. Pressure switch input okay, but no Trial-for-Ignition after purge delay	A. Miswired (check PSW terminal voltage: 24Vac ± 10%) B. Flame sense problem (existing flame: check LED - 2 flashes) C. Bad control (check line voltage between L1 & IND)
4. Valve on, no spark	A. Shorted electrode B. Open HV cable C. Bad control
5. Spark on, no valve	A. Valve coil open B. Open valve wire C. Bad control (check 24Vac voltage between V1 & V2)
6. Flame ok during TFI, no flame sense (after TFI)	A. Bad electrode B. Bad HV igniter wire C. Poor ground at burner D. Poor flame (check flame current)

22. TROUBLESHOOTING GUIDE

WARNING Improper adjustment, alteration, service or maintenance can cause property damage, injury or death. This heater must be installed and serviced only by a trained gas service technician

SEQUENCE OF EVENTS *(also see DSI Troubleshooting previous page)*


APPLY 120 VOLTS - GREEN LIGHT IS ON
NO
• REMEDY 120 VOLTS SUPPLY FAULT
SET THERMOSTAT TO CALL FOR HEAT
COMBUSTION AIR BLOWER STARTS
NO
• CHECK 120V TO DSI AT "L1"
• CHECK 120V OUT AT "IND" FROM DSI TO BLOWER
NO
• FAULTY RELAY SWITCH IN DSI — REPLACE DSI
YES
AIR PROVING SWITCH HAS CLOSED 24 VOLTS IS PRESENT AT "PSW" AT DSI CONTROL.
NO
• CHECK TUBING TO SWITCH IS CONNECTED AND NOT BLOCKED OR KINKED
• CHECK AIR PRESSURE WITH MANOMETER
• CHECK FOR OBSTRUCTION IN THE AIR INTAKE
• REPLACE DEFECTIVE BLOWER
• CHECK INTEGRITY OF SWITCH
• REPLACE DEFECTIVE SWITCH
YES
BLOCKED FLUE SWITCH IS CLOSED 24 VOLTS IS PRESENT AT "TH" AT DSI CONTROL.
AMBER LIGHT IS ON
NO
• CHECK TUBING TO SWITCH IS CONNECTED AND NOT BLOCKED OR KINKED
• CHECK AIR PRESSURE WITH MANOMETER
• CHECK INTEGRITY OF SWITCH
• REPLACE DEFECTIVE SWITCH
• CHECK FOR AND REMEDY ANY OBSTRUCTION IN THE VENT / TUBE
YES
SPARK IGNITER / SENSOR
NO
• CHECK DSI CONTROL FUSE FOR CONTINUITY
• VISIBLY CHECK IF IGNITER IS SHORTING OUT
• CHECK GROUND WIRING
• REMOVE AND INSPECT IGNITER AND LEAD
• CHECK BOOT OF THE IGNITION CABLE FOR SIGNS OF MELTING OR OVERHEATING
• IF "YES" ... TAKE PROTECTIVE ACTION TO SHIELD CABLE AND BOOT FROM EXCESSIVE TEMPERATURE; REPLACE ANY DEFECTIVE COMPONENT
• CHECK CERAMIC INSULATOR AND CAP
• CHECK SPARK GAP SETTING IS 3/16" (ADJUST BY MOVING THE GROUND PRONG ONLY)
• PERFORM IGNITION LEAD TEST (See SPARK IGNITION CIRCUIT INSTRUCTIONS—Section 22)
• GOOD SPARK.....REPLACE IGNITER
• NO SPARK/OR WEAK.....REPLACE CONTROL
YES
24V TO GAS VALVE - RED LIGHT IS ON
CONTINUED


MAIN BURNER LIGHTS
NO
YES
CHECK FOR STRONG SPARK AT IGNITER.....
(SEE PREVIOUS PAGE).
CHECK FOR 24 VAC ACROSS GAS VALVE.
CHECK OUTPUT VOLTAGE FROM CONTROL TERMINALS TO GAS VALVE.....IF NO VOLTAGE REPLACE CONTROL.
CHECK ELECTRICAL WIRING, AND VOLTAGE BETWEEN IGNITION CONTROL AND GAS VALVE.
IF OK, REPLACE GAS VALVE.
SPARK STOPS WHEN BURNER LIGHTS
NO
YES
CONTROL IS NOT SENSING FLAME WITHIN THE 21 SECOND TFI AND IS STILL TRYING TO LIGHT
CHECK CONTINUITY OF SENSOR CABLE AND GROUND WIRE
CHECK BURNER FLAME IS COVERING SENSOR.
CHECK FLAME SIGNAL IN SERIES WITH THE GROUND AND MODULE FOR 1.5UA MINIMUM.
IF SIGNAL IS LOWER CHANGE IGNITER.
IF CHECKS ARE OK.....REPLACE CONTROL.
SYSTEM RUNS UNTIL CALL FOR HEAT ENDS
NO
YES
NOTE: IF IGNITION CONTROLS GOES INTO A LOCKOUT, INTERRUPT POWER AND RESTART.
CHECK CONTINUITY OF SENSOR CABLE AND GROUND WIRE AS A POOR GROUND COULD RESULT IN ERRATIC BEHAVIOUR AND NUISANCE SHUTDOWNS EVEN THOUGH OPERATION IS NORMAL AT THE TIME OF CHECKOUT.
CHECK FOR EXCESSIVE HEAT AT SENSOR INSULATOR AS TEMPERATURES ABOVE 1000°F(538°C) CAUSES SHORT TO GROUND.
CHECK FLAME SIGNAL IN SERIES WITH THE GROUND AND MODULE FOR A MINIMUM 1.5UA.
IF SIGNAL IS LOWER CHANGE IGNITER.
IF CHECKS ARE OK.....REPLACE CONTROL.
CALL FOR HEAT ENDS:
SYSTEM SHUTS OFF
NO
YES
CHECK TEMPERATURE CONTROLLER.
CHECK FOR FAULTY WIRING, REMOVE GAS VALVE LEAD AT CONTROL ,
IF VALVE CLOSES, RECHECK THE TEMPERATURE CONTROLLER AND WIRING.
IF VALVE STAYS OPEN....REPLACE GAS VALVE
TROUBLESHOOTING ENDS
SEE S87J DSI CHECK

23. COMMISSIONING REPORT

THIS APPLIANCE HAS BEEN FACTORY TESTED PRIOR TO SHIPMENT.

HOWEVER, IT IS NOT A “PLUG-IN” APPLIANCE AND REQUIRES FIELD ADJUSTMENT AND COMMISSIONING TO ENSURE SAFE AND EFFICIENT OPERATION.

A QUALIFIED GAS SERVICE TECHNICIAN MUST COMMISSION THE APPLIANCE AND COMPLETE THE COMMISSIONING REPORT.

CONFIRM THAT THE APPLIANCE IS INSTALLED ACCORDING TO ALL LOCAL AND NATIONAL CODES AND THE INSTRUCTIONS IN THIS MANUAL.

ENSURE THAT SITE CONDITIONS MEET THE SPECIFICATIONS IN THIS MANUAL:

- **SUSPENSION**
- **CLEARANCES TO COMBUSTIBLE MATERIAL**
- **VENTING AND AIR SUPPLY**
- **ELECTRICAL SUPPLY, WIRING, AND CONNECTION**
- **GAS CONNECTION, SUPPLY AND MANIFOLD PRESSURE**

THIS COMMISSIONING REPORT MUST BE SUBMITTED TO OUR TECHNICAL SERVICES DEPARTMENT PRIOR TO ANY CALL FOR TECHNICAL ASSISTANCE.

FAX THE COMPLETED REPORT TO 1-866-361-0523

Call Technical Services: 1-877-446-3727

INSTALLING CONTRACTOR: ……

COMMISSIONING TECHNICIAN: ……..

ADDRESS: ……

CITY: ……

STATE/PROV: ……

PHONE: ……

CELL: ……

DATE INSTALLED: ……

PROJECT NAME: ……

PROJECT CITY: ……

HEATER MODEL #: ……

HEATER SERIAL #: ……

WARNING **START UP ‘SMOKE’**

During start up, material coatings used in the production process of tubes and reflectors will “burn off” and create smoke during the first hour of operation. This is normal and temporary . Please ensure that there is sufficient ventilation to adequately clear the smoke from the space. Notify site and safety personnel to ensure that alarm systems are not unduly activated.

QUALIFIED GAS SERVICE TECHNICIAN TO COMPLETE THIS TUBE HEATER COMMISSIONING REPORT

TYPE OF GAS:	NG ☐	LP ☐
DOES BUILDING HAVE A NEGATIVE CONDITION:	YES ☐	NO ☐
IF THIS IS A HIGH ALTITUDE AREA WHAT IS THE ALTITUDE ABOVE SEA LEVEL	_____ Ft	
DOES APPLICATION REQUIRE FRESH AIR TO BURNER	YES ☐	NO ☐
IS HEATER EXPOSED TO CHEMICAL OR CORROSIVE ATMOSPHERE:	YES ☐	NO ☐
ARE ACTUAL MINIMUM CLEARANCES AS PER TABLE 3	YES ☐	NO ☐
CAN HEATER BE AFFECTED BY OVERHEAD CRANES / VIBRATION	YES ☐	NO ☐
ARE GAS SUPPLY LINES ADEQUATELY SIZED FOR SYSTEM	YES ☐	NO ☐
GAS LINES AND BRANCHES HAVE BEEN PURGED OF AIR:	YES ☐	NO ☐
THIS HEATER FIRED WITHOUT ANY MALFUNCTION:	YES ☐	NO ☐
INLET GAS SUPPLY PRESSURE WITH HEATER OPERATING :	_____	WC"
GAS VALVE OUTLET (Manifold) PRESSURE WITH HEATER OPERATING:	_____	WC"
WHAT IS THE LINE VOLTAGE READING AT THE HEATER	_____	VOLTS
WHAT IS THE VOLTAGE READING AT THE IGNITION MODULE	_____	VOLTS
WHAT IS THE FLAME SIGNAL STRENGTH IN uA FROM SENSOR:	_____	uA (microamps)
IS HEATER CONTROLLED BY A THERMOSTAT	YES ☐	NO ☐
IS THE THERMOSTAT STRATEGICALY LOCATED	YES ☐	NO ☐
WHAT IS TOTAL LENGTH OF INSTALLED THERMOSTAT WIRE	_____	FEET
WHAT IS THE GAUGE OF THE THERMOSTAT WIRE	_____	GAUGE
WHAT IS THE HEATER TUBE LENGTH (10ft per Tube section)	_____	FEET
WHAT IS THE TOTAL LENGTH OF THE VENT (add 10ft for each bend)	_____	FEET
WHAT LENGTH IS COMBUSTION AIR INTAKE (add 10ft for each bend)	_____	FEET
IF REQUIRED....WHAT IS THE LENGTH OF THE TURBULATOR(S)	_____	FEET
IF INSTALLED....IS TURBULATOR AT FLUE END OF SYSTEM	YES ☐	NO ☐
"MAXIMUM STACKING HEIGHT" SIGN(S) - POSTED AT THERMOSTAT(S)	YES ☐	NO ☐

THIS HEATER MUST BE ELECTRICALLY GOUNDED ACCORDING TO ALL NATIONAL AND LOCAL CODES

FAX COMPLETED REPORT TO TECHNICAL SERVICES: FAX 1-866-361-0523, CALL: 1-877-446-3727

24. BTUH INPUT RATINGS AND CORRESPONDING DIMENSIONS

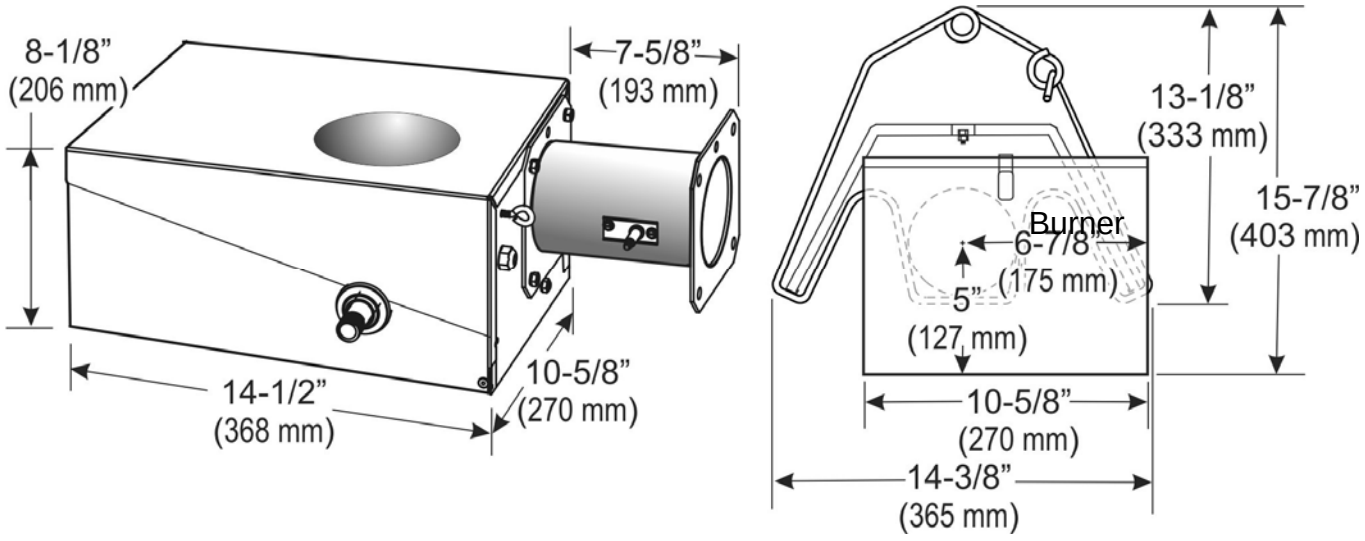
INPUT BTUH (kW) Canada: 0' to 4500' USA: 0' to 2000'	NOMINAL LENGTH FT (m)	OVERALL HEATER LENGTH* FT (m)	APPROX NET WEIGHT** LBS (kg)
200,000 (59)	70 (21.34)	69'-10" (21.29)	600 (272)
200,000 (59)	60 (18.29)	60'-2" (18.34)	518 (235)
160,000 (47)	60 (18.29)	60'-2" (18.340	518 (235)
160,000 (47)	50 (15.24)	50'-6" (15.39)	436 (198)
130,000 (38)	50 (15.24)	50'-6" (15.39)	436 (198)
130,000 (38)	40 (12.19)	40'-10" (12.45)	354 (161)
90,000 (26)	40 (12.19)	40'-10" (12.45)	354 (161)
90,000 (26)	30 (9.14)	31'-2" (9.50)	272 (123)
60,000 (18)	30 (9.14)	31'-2" (9.50)	272 (123)
60,000 (18)	20 (6.10)	21'-6" (6.55)	190 (86)

→ Manufactured and shipped in 10 ft lengths.

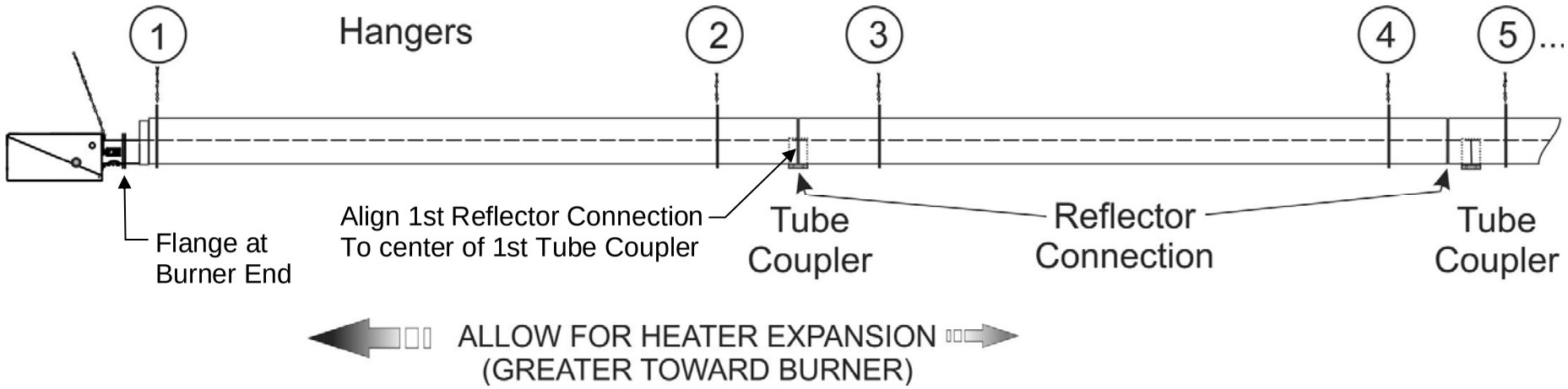
→ Swaged tube has approximate 4 inch (10 cm) overlap -

- Net length of first and intermediate tubes is 116 inches (295 cm)
- Last tube is 120" (305 cm) [the 4 inch swage length is exposed for vent connection]
- Total tube length is approximately 4 inches (10 cm) shorter for each multiple of 10 feet (305 cm)
- Overall length of heater includes the burner.

** Burner weight is 26 pounds (11.8 kg)
Each 10 ft (305 cm) tube/reflector section weighs 82 pounds (37.2 kg)



25. HANGER LOCATION: DISTANCE RANGES FROM FLANGE AT BURNER

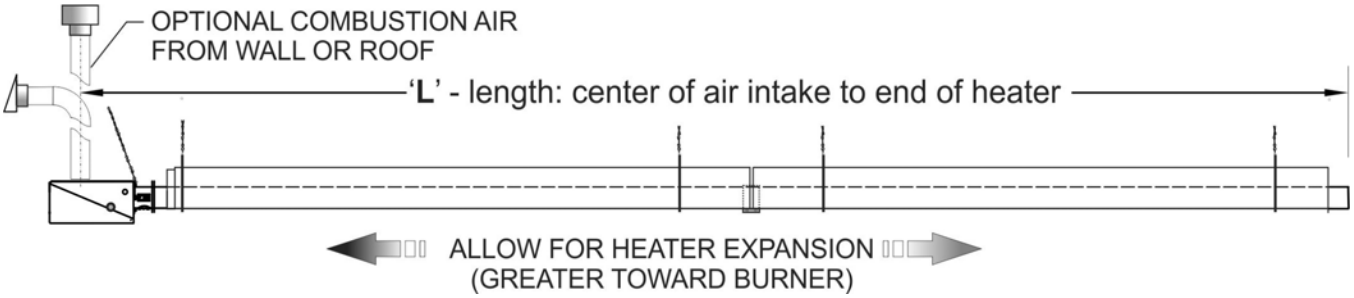


	BEST RANGES FOR HANGER LOCATION: DISTANCE IN INCHES FROM FLANGE AT BURNER END													
Tube #	1		2		3		4		5		6		7	
Tube Connection*	116		232		348		464		580		696		816	
Reflector Connection	116		230		344		458		572		686		800	
Hanger # →	1	2	3	4	5	6	7	8	9	10	11	12	13	14
System Length (ft) 20'	6	104-110	122-134	221-227										
30'	6	104-110	122-134	218-224	236-242	335-341								
40'	6	104-110	122-134	218-224	236-242	332-338	352-358	449-455						
50'	6	104-110	122-134	218-224	236-242	332-338	352-358	446-452	468-474	563-569				
60'	6	104-110	122-134	218-224	236-242	332-338	352-358	446-452	468-474	560-566	584-590	677-683		
70'	6	104-110	122-134	218-224	236-242	332-338	352-358	446-452	468-474	560-566	584-590	674-680	700-706	791-797
Hanger # →	1	2	3	4	5	6	7	8	9	10	11	12	13	14

* The Tube Coupler extends 2 inches each side of tube connection

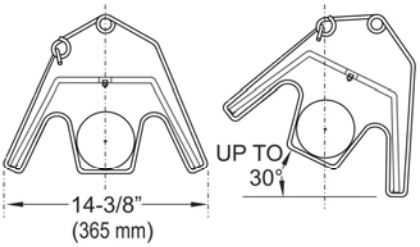
Locate hangers a minimum of 2 inches (5 cm) and a maximum of 22 inches (56 cm) from the edge of any tube coupler

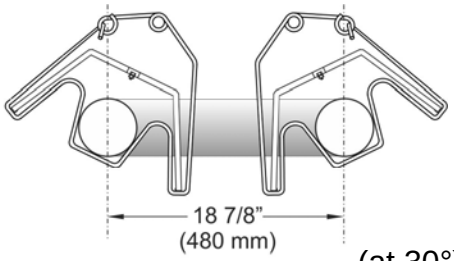
DIMENSIONS AIR INTAKE TO VENT END


OPTIONAL COMBUSTION AIR
FROM WALL OR ROOF
'L' - length: center of air intake to end of heater
ALLOW FOR HEATER EXPANSION
(GREATER TOWARD BURNER)

Tube Length	'L' = center air intake to end	Tube Length	'L' = center air intake to end
20'	20'-7 1/4" ; 247 1/4" ; 628 cm	50'	49'-7 1/4" ; 595 1/4" ; 1512 cm
30'	30'-3 1/4" ; 363 14" ; 923 cm	60'	59'-3 1/4" ; 711 1/4" ; 1807 cm
40'	39'-11 1/4"; 479 14" ; 1217 cm	70'	68'-11 1/4"; 827 1/4" ; 2101 cm

HANGER / REFLECTOR ORIENTATION HORIZONTAL TO 35^0

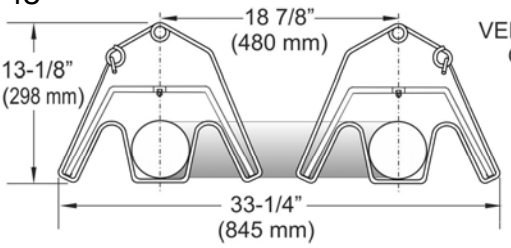


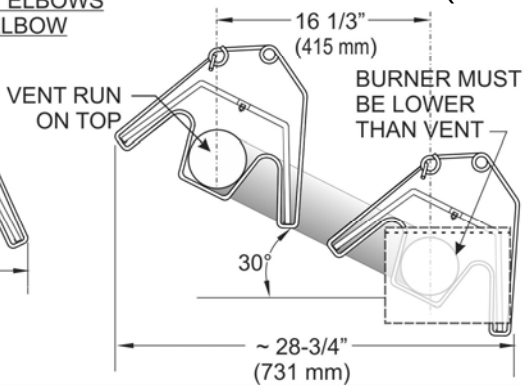


(at 30°)

See Elbow Dimensions
~Page 45~

COMBINE TWO x 90° ELBOWS
CREATES 180° ELBOW





26. BURNER & TUBE KIT ASSEMBLY CHART MODELS UHE, EIH

MODELS UHE & EIH are approved for indoor commercial / industrial non-residential applications. For outdoor, wet and harsh environment applications refer to models UHE-P / EIH-P and UHE-S / EIH-S.

BEFORE INSTALLING: Check that you have the correct tube kit(s) for the burner input

MODELS: ultraSchwank UHE
InfraSave Ultimate EIH

High Radiant Output Tube Heaters for Commercial / Industrial Indoor Applications

		Order: TUBE KIT PART # & QUANTITY REQUIRED						
		COMPLETE	PRIMARY TUBE KITS			SECONDARY TUBE		
		60 Mbh	60 to 130	160 Mbh	200 Mbh	20 ft Secondary Kits		
Turbulator* -->		6 ft	None	None	None	None	2 ft	6 ft
Tube Kit Part #		TK-P620-UL	TK-P020-UL	TK-P160-UL	TK-P200-UL	TK-S020-UL	TK-S220-UL	TK-S620-UL
Input Btuh	*Tube Length*	20'	20'	20'	20'	20'	20'	20'
60,000	20'	1						
	30'		1+					
90,000	30'		1+					
	40'		1+			1		
130,000	40'		1+					1
	50'		1+			1+		
160,000	50'	Stainless Steel Combustion Tube		1+				1
	60'	Stainless Steel Combustion Tube		1+		1+	1	
200,000	60'	Stainless Steel Combustion Tube			1+	1+	1	
	70'	Stainless Steel Combustion Tube			1+	2+		

NOTE: UHE / EIH Series Burners require 120V electrical supply

Tube Kits for models UHE & EIH have an insulated double reflector.

All tube kits include tubes, insulated reflectors, tube couplers, and hangers required for installation.

Model 60,000 x 20 ft has a 6 ft turbulator installed in a tube in the Primary Tube Kit TK-P620-UL

Tube Heaters longer than 20 feet require a Primary Kit and at least one additional Secondary Tube Kit.
- **Primary Tube Kits include the flanged combustion chamber tube plus one additional tube**

A Secondary Tube Kit requires a Primary Tube Kit.
- **Secondary Tube Kits include steel heat exchanger tubes and turbulator if required.**

*** TURBULATORS:**
- **If a turbulator is required it is factory installed in a clearly labeled tube in the Secondary Tube Kit.**
- **A turbulator must always be installed in the last tube at the vent end of the heater.**

27. HIGH ALTITUDE INSTALLATION

When this appliance is installed above the stipulated altitude for the USA or Canada, the input must be de-rated by 4% for each 1000 ft above the stipulated altitude. **If your local utility supplies gas with a de-rated heat content, no orifice change is required in the heater** . Check with your local utility regarding de-rating of this appliance.

USA: The factory installed orifice for this appliance is approved for altitudes zero to 2000 feet above sea level. When installed above 2000 feet, refer to the table above for the correct orifice.

Canada: The factory installed orifice for this appliance is approved for altitudes zero to 4500 feet above sea level. When installed above 4500 feet, refer to the table above for the correct orifice.

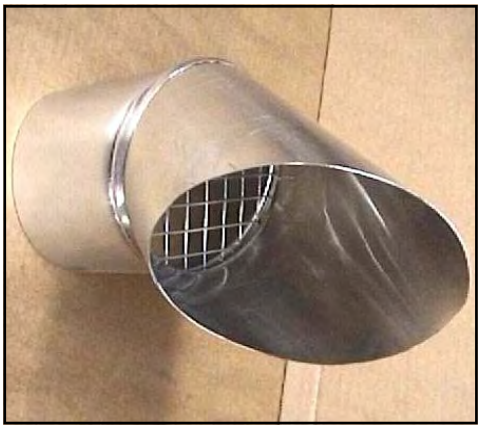
ORIFICE - ALTITUDE CONVERSION CHART (see NOTES above)

MODEL NO	STD ORIFICE Drill Size / Part#	FOR USE AT ALTITUDES ABOVE (FEET)							
		2000	3000	4000	5000	6000	7000	8000	9000
UHE / EIH-60N	26 DMS JS-0726-DM	27 DMS JS-0727-DM	9/64" JS-0714-IN	28 DMS JS-0728-DM	29 DMS JS-0729-DM	29 DMS JS-0729-DM	30 DMS JS-0730-DM	30 JS-0730-DM	1/8 JS-0713-IN
UHE / EIH-90N	15 DMS JS-0715-DM	17 DMS JS-0717-DM	17 DMS JS-0717-DM	18 DMS JS-0718-DM	19 DMS JS-0719-DM	19 DMS JS-0719-DM	20 DMS JS-0720-DM	22 DMS JS-0722-DM	23 DMS JS-0723-DM
UHE / EIH-130N	5.8 mm JS-0758-MM	2 DMS JS-0702-DM	7/32" JS-0722-IN	3 DMS JS-0703-DM	3 DMS JS-0703-DM	4 DMS JS-0704-DM	5 DMS JS-0705-DM	7 DMS JS-0707-DM	9 DMS JS-0709-DM
UHE / EIH-160N	1/4" JS-0725-IN	'C' Drill Size JS-070C-NS	'B' Drill Size JS-070B-NS	6 mm JS-0760-MM	'A' Drill Size JS-070A-NS	1 DMS JS-0701-DM	1 DMS JS-0701-DM	2 DMS JS-0702-DM	3 DMS JS-0703-DM
UHE / EIH-200N	'N' Drill Size JS-070N-NS	'M' Drill Size JS-070M-NS	'L' Drill Size JS-070L-NS	'L' Drill Size JS-070L-NS	9/32" JS-0728-IN	7.0 mm JS-0770-MM	'I' Drill Size JS-070I-NS	17/64" JS-0726-IN	'G' Drill Size JS-070G-NS

28. OPTIONAL ACCESSORIES

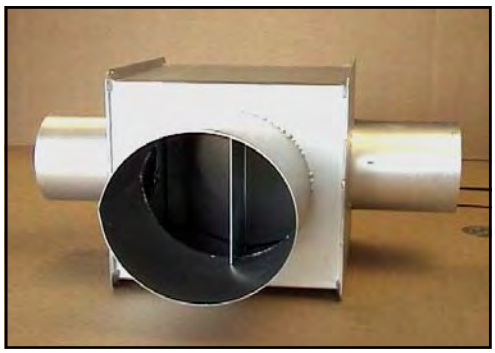
Flue Vent Terminal

4” wall horizontal JA-0528-XX
6” wall horizontal JA-0529-XX



Torctite Coupler (c/w 2 bolts) JA-0516-SW

Vent Tee 4” X 4” X 6”
(2 couplers optional) JA- 0514-XX

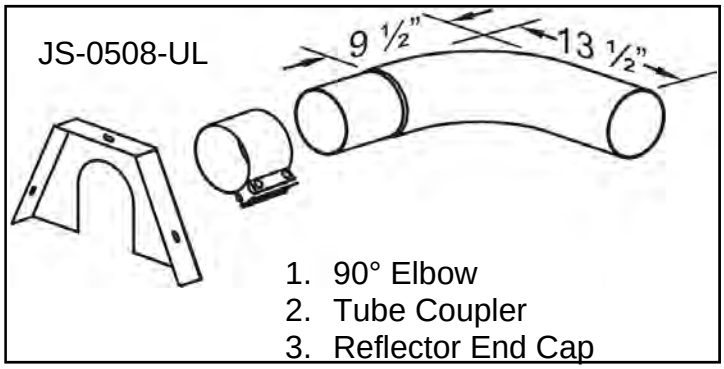


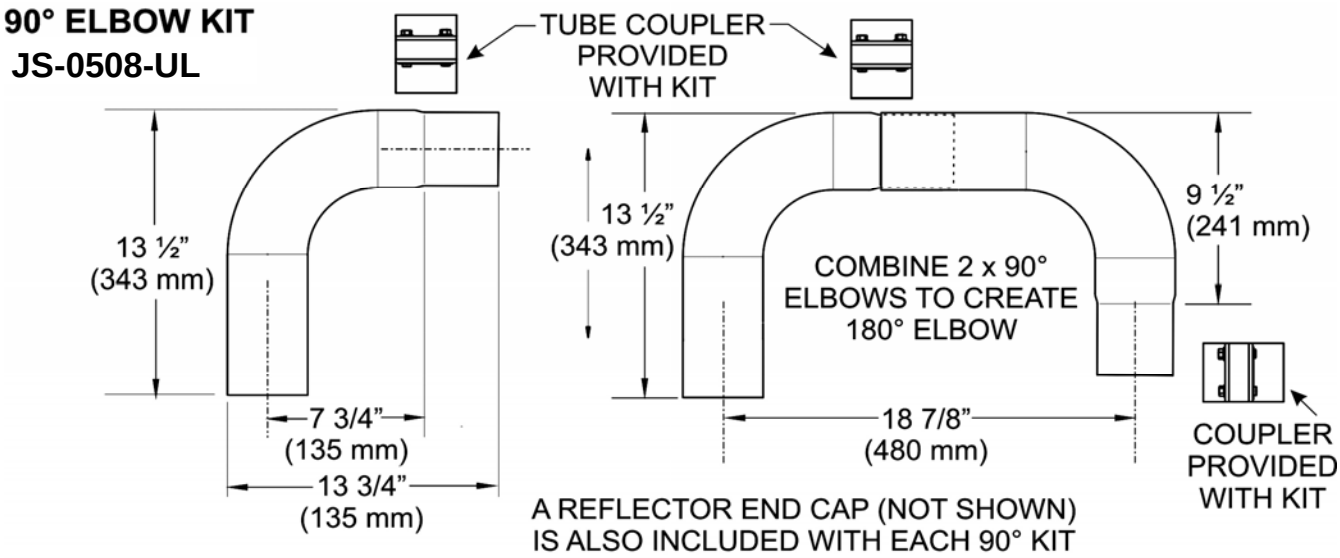
90 degree Aluminized Steel Elbow Kit*

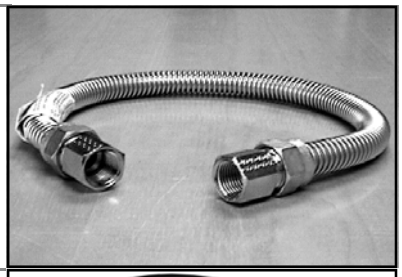
*Kit includes: elbow, tube coupler, and reflector end cap.

See dimensions below

For 180 degree Elbow Applications order 2 x 90 degree Elbow kits.




90° ELBOW KIT
JS-0508-UL
TUBE COUPLER PROVIDED WITH KIT
13 ½" (343 mm)
7 3/4" (135 mm)
13 3/4" (135 mm)
13 ½" (343 mm)
COMBINE 2 x 90° ELBOWS TO CREATE 180° ELBOW
9 ½" (241 mm)
18 7/8" (480 mm)
COUPLER PROVIDED WITH KIT
A REFLECTOR END CAP (NOT SHOWN) IS ALSO INCLUDED WITH EACH 90° KIT

***USA Only*: Supplied in Burner Kit** **Flexible Gas Connector**	Input - 130,000 or less: JL-0771-XX - 1/2"x24" ..... Input - 160,000 or more: JL-0771-YY - 3/4"x36"	
***CANADA Only*: Supplied in Burner Kit** **Type 1 Hose Gas Connector** 45,000 to 110,000 Btuh, 1/2" x 36" Hose 1/2" MPT x 1/2" MPT 130,000 to 200,000 Btuh, 3/4" x 36" Hose 1/2" MPT x 3/4" MPT	JL-0771-RC JL-0771-RB	
#2 Lion Chain (115 lb work load) **- 200 ft roll** **'S' Hooks** - 1 7/8" - package of 25	JL-0800-XX JL-0798-SH	

TruTemp Thermostat
True comfort control for radiant heating systems - senses and averages ambient and radiant temperatures.
Occupancy sensor with auto set-back of 9°F (5°C).

Do not use in wet or corrosive environments

JM-0150-XX

Low Voltage Digital Thermostat
(24 Volts - °F or °C selectable)

Not for use in corrosive or wet environments

JS-0569-WR

<u>Multiple Heaters</u> per 24V Thermostat

Relay Switch: One required for each burner after the first burner in a zone (1st burner connects to 24V thermostat)

Refer to wiring diagram Page 39

(field installed at or in burner)

NOTE: FENWAL DSI has built in relay for blower operation

JS-0568-CC

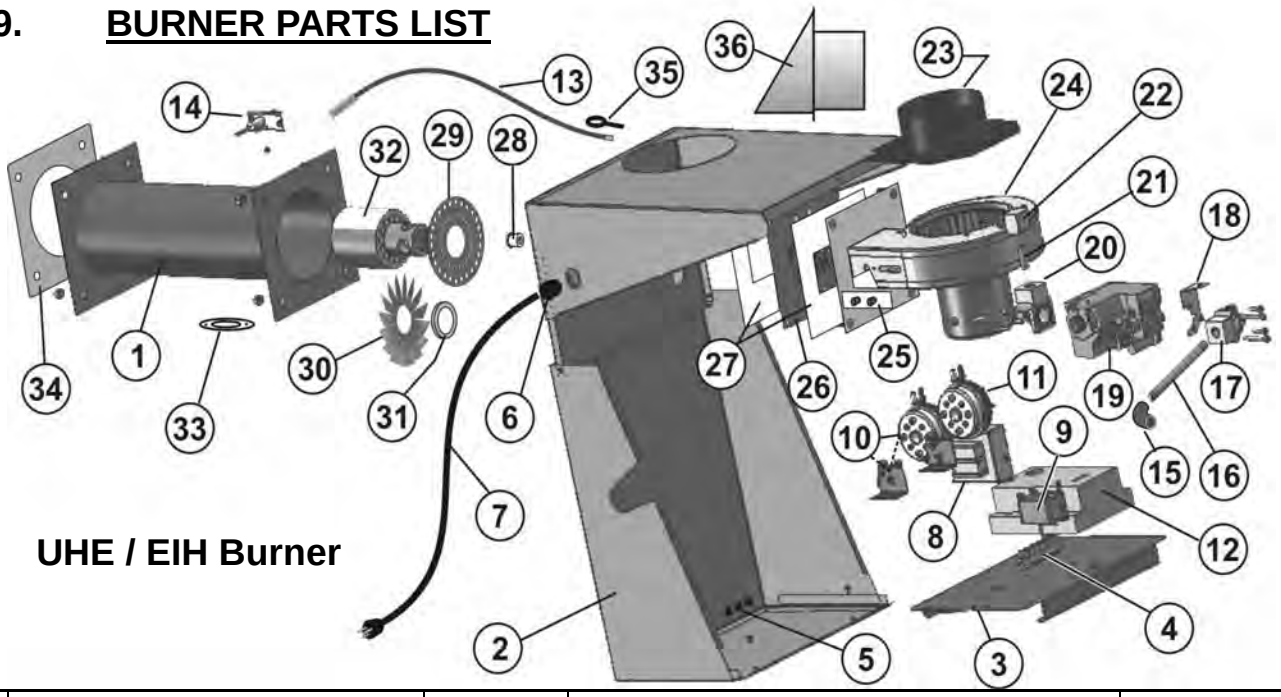
Line Voltage Thermostat:
Dual Scale: °F or °C

(Not exactly as shown - has dual scale °F & °C)

Not for use in corrosive or wet environments

JL-0772-XX

29. BURNER PARTS LIST

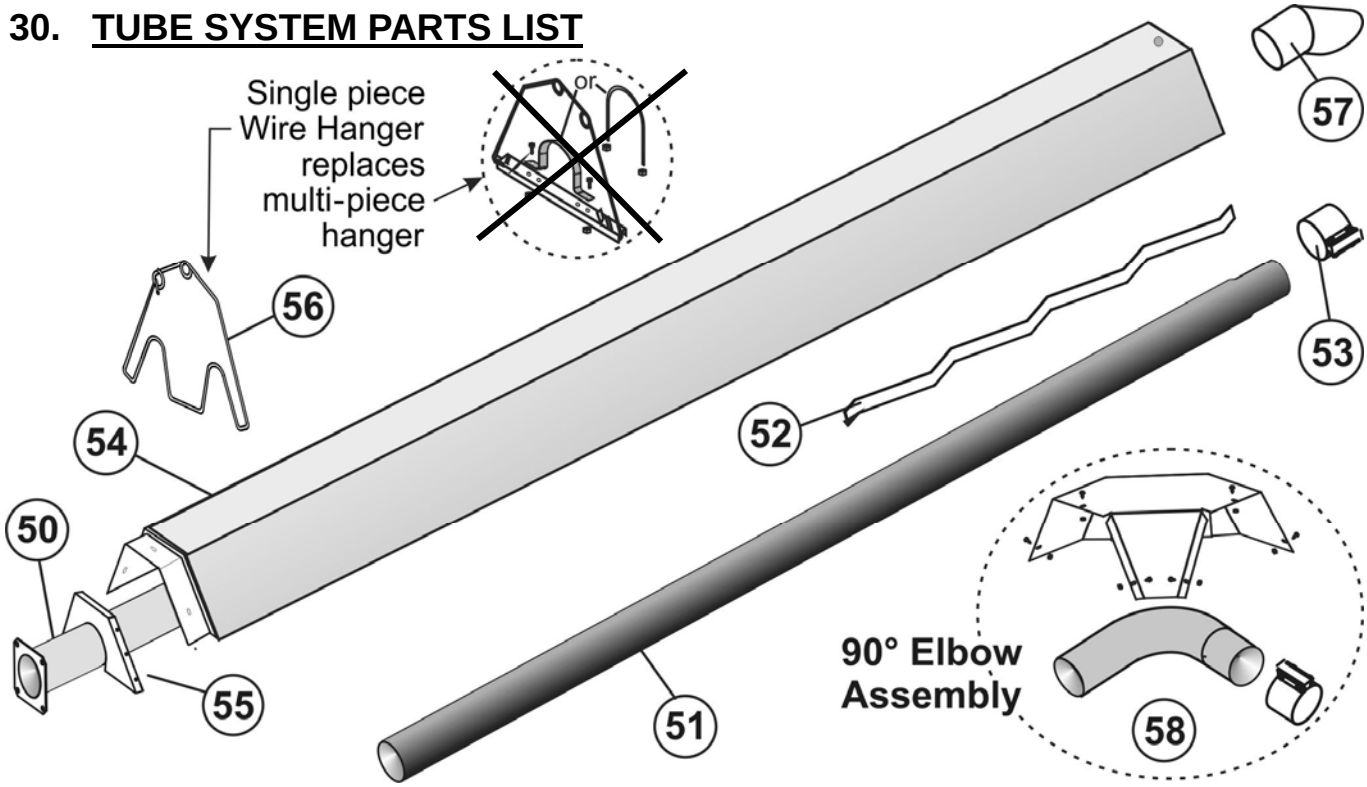


UHE / EIH Burner

#	PART NAME	PART #	PART DESCRIPTION	SUPPLEMENT
1	**FLANGED ADAPTER**	JS-0501-UL	4" Dia. x 7-3/4" Flanged Adapter - UL	
2	**BURNER ASSEMBLY HOUSING**	JS-0582-UL	Burner housing coated orange - Schwank	
		JJ-0582-UL	Burner housing coated grey - InfraSave	
3	**COMPONENT PLATE**	JS-0581-UL	Component Mounting Plate	
4	**TERMINAL BLOCK**	JM-0455-DD	Terminal block	
5	**STATUS INDICATOR LIGHTS**	JW-0519-AM	Indicator light - Amber	
		JW-0519-GR	Indicator light - Green	
		JW-0519-RE	Indicator light - Red	
6	**HOUSING GROMMET**	JP-2033-XX	Grommet connector - electrical cord & spark wire	
7	**ELECTRICAL CORD**	JB-0567-XX	Electrical Cord - 6' with standard 120V plug	
8	**STEP DOWN TRANSFORMER**	JA-0775-XX	Transformer 120/24V, 20VA AT120B1028	
9	**RELAY SWITCH 24V/120V**	JS-0568-CC	24V/120V Relay Switch	
10	**BLOCKED FLUE PROVING SWITCH**	JS-0577-TT	Blocked Flue Switch 0.60" WC	60,000
	(Normally Closed Switch)	JS-0577-YA	Blocked Flue Switch 0.70" WC	90,000
	Mounting bracket is attached to switch	JS-0577-UL	Blocked Flue Switch 0.74" WC	130,000
		JS-0577-YY	Blocked Flue Switch 0.90" WC	160,000
		JS-0578-UL	Blocked Flue Switch 1.03" WC	200,000
11	**COMBUSTION AIR PROVING SWITCH**	JS-0575-UL	Air Proving Switch 0.70" WC	60,000
	(Normally Open Switch)	JS-0576-UL	Air Proving Switch 1.10" WC	90, 130, 200,000
	Mounting bracket is attached to switch	JS-0575-ZB	Air Proving Switch 0.90" WC	160,000
	AIR SWITCH TUBING *(NOT SHOWN)*	JS-0572-SE	Air Switch Tubing Set 2 Pieces 1/4" x 20" PVC	
	Burners with FENWAL IGNITION CONTROL - Models: UHE-F; EIH-F			
12	**FENWAL DSI CONTROL**	JA-0567-XX	3-Trial 24Vac with blower relay	"-F" Models
	REPLACEMENT KIT: FENWAL & S87J	JA-0568-KT	Fenwal Control + Wire Harness + Cable + Igniter: Replaces Fenwal & S87J	
13	**IGNITION CABLE - FENWAL**	JS-0518-SA	Hi voltage wire (24") STW - 2 x 1/4" Spades	
	Burners with HONEYWELL S87-J IGNITION CONTROL - Models: UHE / EIH			
12	**HONEYWELL IGNITION CONTROL**	JA-0568-XX	DISCONTINUED - NO LONGER AVAILABLE	
	REPLACEMENT KIT: WITH FENWAL DSI	JA-0568-KT	Fenwal Control + Wire Harness + Cable + Igniter: Replaces HONEYWELL S87J	
13	**IGNITION CABLE HONEYWELL S87J**	JS-0518-XX	High Voltage Ignition Cable (24")	

#	PART DESCRIPTION	PART #	PART DESCRIPTION	SUPPLEMENT
14	**IGNITER KIT**	JA-0571-KT	Spark Igniter & Gasket Kit	
15	**90° GAS SUPPLY ELBOW**		90° Gas Elbow - 1/2" x 1/2"	
16	**GAS SUPPLY NIPPLE - 4"**		4" x 1/2" Gas Supply Nipple	
17	**90° INLET FLANGE ELBOW**	JS-0588-UM	Valve Inlet 90° Flange Elbow - 1/2"F x 1/2"F	
18	**GAS VALVE MOUNT BRACKET**	JS-0585-UA	Mounting Bracket - Gas Valve to Blower Assembly	
19	**GAS VALVE**	JL-0701-AA	Combination Gas Valve - 3.5" wc 24Vac NG	
		JA-0506-XX	Slow Opening Gas Valve - 3.5" wc 24Vac NG	200,000 ONLY
20	**90° OUTLET FLANGE ELBOW**	JS-0588-UL	Valve Outlet 90° Flange Elbow - 3/8"F x 1/2"F	
21	**GAS NIPPLE**		1" x 1/2" Gas Supply Nipple	
22	**ORIFICE HOLDER**	JS-0585-UD	Orifice Holder - 90° Elbow	
23	**AIR INTAKE ADAPTER**	JS-0595-SP	Air Inlet Adapter with Air Restrictor Orifice - 1-3/4"	60 NG
		JS-0595-UA	Air Inlet Adapter with Air Restrictor Orifice - 2"	90 NG
		JS-0595-UD	Air Inlet Adapter with Air Restrictor Orifice - 2-3/8"	130 & 160 NG
		JS-0595-UG	Air Inlet Adapter with Air Restrictor Orifice - 2-3/4"	200 NG
24	**BLOWER ASSEMBLY**	JS-0579-UL	Blower assembly Ultra burner	
25	**PRESSURE SWITCH TUBING ADAPTER**	JS-0585-UG	Adapter to connect 1/4" pressure switch tubing	
26	**EQUALIZER PLATE**	JS-0593-UA	Outlet equalizer plate UL 60 NG	60 NG
		JS-0593-UD	Outlet equalizer plate UL 90 NG	90 NG
		JS-0593-UG	Outlet equalizer plate UL 130 NG	130 NG
		JS-0593-UJ	Outlet equalizer plate UL 160 NG	160 NG
27	**FLANGE ADAPTER GASKET**	JS-0591-XX	Gasket - Flange Adapter to Tube	
28	**MAIN BURNER ORIFICE**	JS-0726-DM	Gas orifice 60 Mbh NG Ultra - 26 DMS	60 NG
		JS-0715-DM	Gas orifice 90 Mbh NG Ultra - 15 DMS	90 NG
		JS-0758-MM	Gas orifice 130 Mbh NG Ultra - 5.8 mm	130 NG
		JS-0725-IN	Gas orifice 160 Mbh NG Ultra - 1/4" Drill Size	160 NG
		JS-070N-NS	Gas orifice 200 Mbh NG Ultra - 'N' Drill Size	200 NG
29	**BURNER AIR RESTRICTOR RING**	JS-0585-UJ	Burner Cup Air Restrictor Ring UL 60 NG	60 NG
		JS-0585-UK	Burner Cup Air Restrictor Ring UL 90 NG	90 NG
		JS-0585-UL	Burner Cup Air Restrictor Ring UL 130 NG	130 NG
		JS-0585-UM	Burner Cup Air Restrictor Ring UL 160 NG	160 NG
		JS-0585-UN	Burner Cup Air Restrictor Ring UL 200 NG	200 NG
30	**BURNER AIR DIVERTER**	JS-0585-UP	Burner Air Diverter - UL 60 NG	60,000 NG
		JS-0585-UR	Burner Air Diverter - UL 90 NG	90,000 NG
31	**AIR DIVERTER RETAINER NUT**	JS-0585-US	Burner Air Diverter Retainer Nut	60 & 90,000 NG
32	**BURNER CUP**	JS-0512-CA	Burner Cup - Cast Aluminum	
33	**SIGHT GLASS ASSEMBLY**	JS-0536-XX	Sight glass assembly - tube heater	
34	**FLANGE GASKET: BURNER / TUBE**	JS-0591-XX	Flange Adapter Gasket	
35	**EYE BOLT**	JF-1012-EB	Eye Bolt	

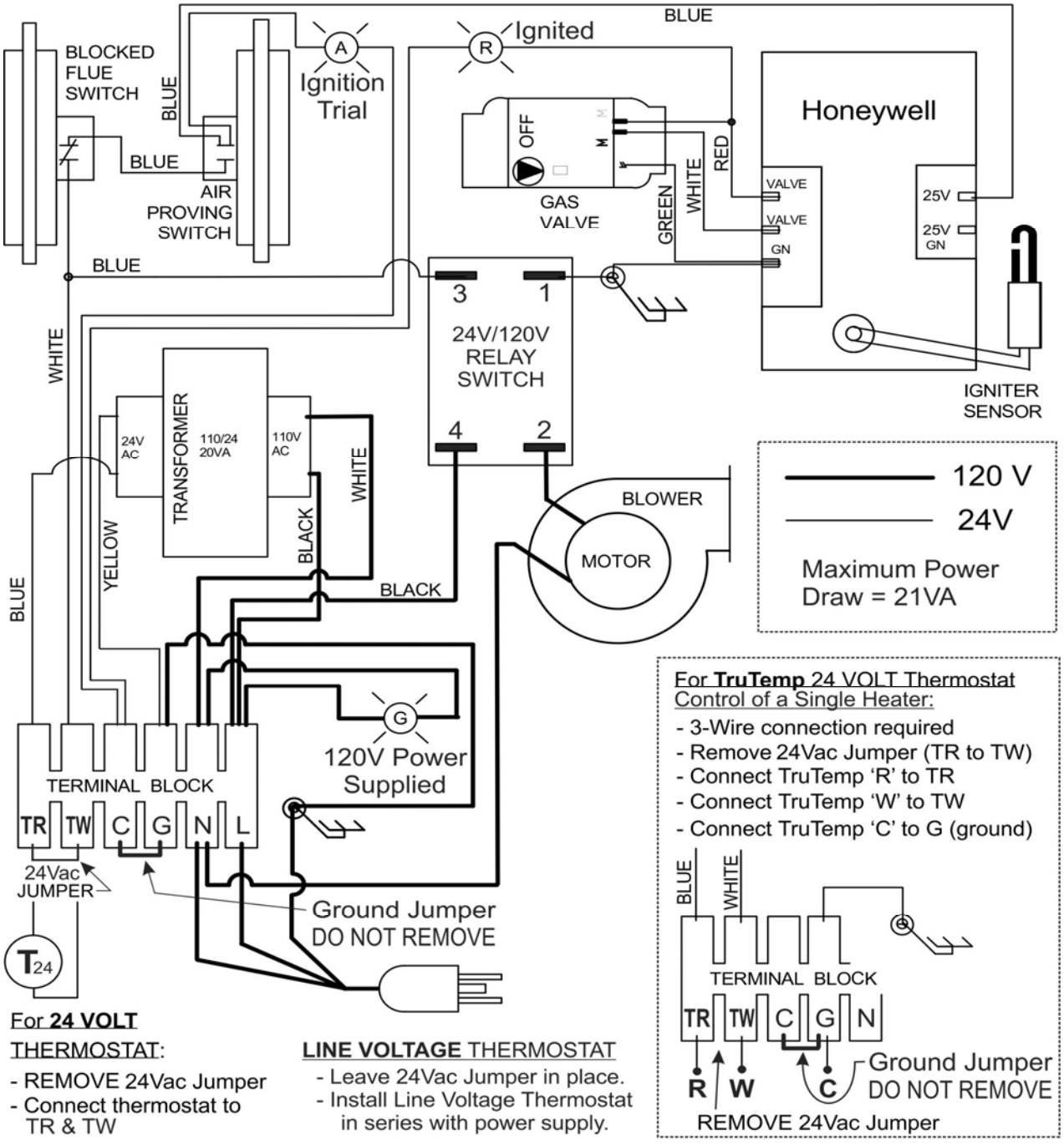
30. TUBE SYSTEM PARTS LIST



#	PART DESCRIPTION	PART #	PART DESCRIPTION PRIMARY	SUPPLEMENT
50	**FLANGED COMBUSTION TUBES**	**JA-0501-SW-P**	Tube flanged - aluminized - swaged -10'	60,000-160,000
		JA-0499-SW-P	Tube flanged - alumatherm - swaged - 10'	200,000
51	**HEAT EXCHANGER TUBES**	**JS-0515-SW-P**	Tube - steel - emissive coated - swaged - 10'	60,000-160,000
		JS-0501-SK	Tube - aluminized - swaged - 10' SECOND TUBE	160 & 200
			- 1/4" hole at female end for special coupling (JA-0516-RK) to 1st tube	
52	**TURBULATOR**	**JS-0533-UA**	Turbulator 2'	160 & 200 x 60 ft
	(see Manual for required length)	**JS-0533-UD**	Turbulator 3'	90 x 30 ft
		JS-0533-UG	Turbulator 6'	60 x 20' & 130 x 40'
		JS-0533-LG	Turbulator 10'	160 x 50 ft
53	**TUBE COUPLER**	**JA-0516-SW**	Coupler 4" swaged tube	
		JA-0516-RK	Coupler + 1/4" Rivet + Drill Bit - 1st to 2nd tube	160 & 200
54	INSULATED DOUBLE REFLECTOR	**JS-0502-HE**	Reflector x 116" - High Temperature Ceramic Insulation	
55	**REFLECTOR END CAP**	**JS-0502-UL**	Reflector end cap - UL	
56	**WIRE HANGER**	**JS-0505-UW**	ULTRA Wire Hanger - horizontal / 30°	
57	**HORIZONTAL VENT TERMINAL**	**JA-0528-XX**	Horizontal wall 4" vent terminal	Optional Accessory
58	**90° ELBOW KIT**	**JA-0508-UL**	90° Elbow + Reflector End Cap + Tube Coupler	Optional Accessory

OTHER DSI's: FENWAL SEE PAGE 31

HONEYWELL S87J DSI: WIRING DIAGRAM: 24V OR 120 VOLT THERMOSTAT OPERATION
SINGLE HEATER PER THERMOSTAT *(Multiple Heaters per Thermostat— page 32)*



Each tube heater requires 120V, 60 HZ electrical power sized for 145VA. The heater includes a 24V/120V relay switch . Maximum power flow for internal 24V burner components is 21VA.

The heater must be electrically grounded in accordance with the National Electrical Code. ANSI / NFPA 70 or current Canadian Electrical code CSA C22.1.

A maximum night set-back of 9°F (5°C) is recommended for optimum economy and comfort. To maintain satisfactory comfort levels do not turn off the heating system over night/weekends.

HONEYWELL S87J: SEQUENCE OF OPERATION

The S87 ignition control module is powered by a 24v transformer and activated when the thermostat calls for heat. On every call for heat the S87J will delay start-up to provide a 30 second system pre-purge. When the S87 is activated by a thermostat or call for heat an internal transformer provides power to the electronic generator circuit for Spark Ignition and the safety lockout timing begins. At the same time, the S87 opens the gas controls main valve allowing gas to flow to the main Burner.

The S87 Control Module performs the following basic functions:

- Provides a 30 second system pre-purge
- Supplies power to the electronic pulse-generator circuit for the Spark Igniter (30,000 volts open circuit).
- Allows 21 seconds for Ignition trial (TFI) before system safety lockout occurs.
- Senses the Burner flame for safe lighting
- Shuts off the spark after the Burner is lit.

Burner with direct spark ignition, sequence is as follows :

1a. **Line Voltage Thermostat:** Upon a call for heat by the line voltage Thermostat or "ON/OFF" switch, the Blower and the 120/24 Volt Transformer in the burner are powered simultaneously with 120 volts.

1b. **TruTemp or other 24 Vac Thermostat:**

A 24Vac thermostat can control only a single heater using the 120/24V transformer in the burner as the 24Vac source of power to the thermostat.

Multiple heaters per 24Vac thermostat require optional Control Center JM-0303-KT

The 120 volt supply to heater powers the 120/24V Transformer and the 120V side of the Blower switching relay simultaneously. A call for heat by the 24 volt Thermostat energizes the 24 volt control circuit and the 24/120 volt relay powering the Blower.

2. The 24 volt control circuit powers the DSI control in series through the normally open Air Pressure Switch (APS) and the normally closed Blocked Flue Switch (BFS).
3. The Blower creates a positive pressure and closes a normally open contact inside the Air Proving Switch (APS).
4. 24 volts supplied to the DSI control initiates the 30 second pre-purge cycle.
5. After completing the 30 second pre-purge cycle the DSI control generates high voltage to the Spark Igniter, and 24 volts to energize the Gas Valve.
6. The Burner will light and establish a steady flame.
7. Once the flame sensor determines there is a steady flame established, with a minimum flame signal of 1.5 µA the spark igniter is then de-energized.
8. In the event ignition does not occur, the safety circuit will function to interrupt gas flow after approximately 21 seconds and lock the system out. No further gas will flow until the power has been manually interrupted for a period of 30 seconds. This will reset the ignition module and the operating sequence will restart at step #1
9. If the blower does not run, the blower air pressure switch (normally open contact) does not close and power is not supplied to the ignition control.

Schwank
INNOVATIVE HEATING SOLUTIONS

LIMITED WARRANTY CERTIFICATE

infrasave
radiant heaters

FOR GAS-FIRED INFRA-RED LOW INTENSITY TUBE HEATERS: UHE and EIH HIGH RADIANT OUTPUT SERIES

The Manufacturer warrants that this product is free from defects in material or workmanship under normal use and service subject to the terms of this document.

THREE YEAR WARRANTY

Subject to the conditions and limitations stated herein, during the term of this limited warranty, we will supply any component part (at our option a new or repaired component part) of the heater as defined below, excluding any labor , which the Manufacturer's examination determines to be defective in workmanship or material for a period of three years (3 years) from the date of installation, unless otherwise specified below. This warranty applies to the heater's original owner, and subsequent transferees and only if the unit is installed and operated in accordance with the printed instructions accompanying the unit and in compliance with all applicable installation codes and good trade practices. Warranty is only applicable to Schwank components, other parts are limited to their own Manufacturers warranty period of one year (1 year).

TEN YEAR WARRANTY

The Manufacturer warrants the burner sub-assembly comprising of ceramic and immediate metal tubing, and the radiating tubes (excluding couplings) for a period of ten years (10 years).

WHAT IS NOT COVERED

The Manufacturer shall not be responsible for any expenses, including service, labor, diagnosis, analysis, material or transportation charges incurred during removal or reinstallation of this product, or any of its components or parts. All labor or service charges shall be paid by the owner. This warranty does not cover heating products improperly installed, misused, exposed to or damaged by negligence, accident, corrosive or contaminating atmosphere, water, excessive thermal shock, impact, abrasion, normal wear due to use, alteration or operation contrary to the owner's manual or if the serial number has been altered, defaced or removed. This warranty shall not apply if the input to the heating product exceeds by more than 2% of the rated input on the rating plate. The Manufacturer shall not be liable for any default or delay in performance by its warranty caused by any contingency beyond its control, including war, government restrictions, or restraints, strikes, fire, flood, acts of God, or short or reduced supply of raw materials or products.

WARRANTY PROCEDURE

To establish the installation date for any purpose under this Limited Warranty, you must retain the original records that can establish the installation date of your unit. If you do not provide such documents, the start date of the term of this Limited Warranty will be based upon the date of unit manufacture, plus thirty (30) days. Failure to maintain the equipment through regular annual service maintenance by a qualified service technician shall void the warranty.

LIMITATIONS AND EXCLUSIONS

This document contains all warranties made by the Manufacturer and may not be varied, altered or extended by any person. There are no promises, or agreements extending from the Manufacture other than the statements contained herein. THIS WARRANTY IS IN LIEU OF ALL WARRANTIES EXPRESSED OR IMPLIED, TO THE EXTENT AUTHORIZED BY THE LAWS OF THE JURISDICTION, INCLUDING SPECIFICALLY THE WARRANTIES OR MERCHANTIBILITY OF FITNESS FOR A PARTICULAR PURPOSE.

It is understood and agreed that the Manufacturer's obligation hereunder is limited to repairing or replacing parts determined to be defective as stated above. In no event shall the Manufacturer be responsible for any alleged personal injuries or other special, incidental or consequential damages. As to property damages, contract, tort or other claim the Manufacturer's responsibility shall not exceed the purchase priced paid for the product.

All replacement parts will be warranted for the unused portion of the warranty coverage period remaining on the applicable unit.

Some Authorities do not allow certain warranty exclusions or limitations on duration of warranty or the exclusions or limitations of incidental or consequential damages. In such cases, the above limitations or exclusions may not apply to you and are not intended to do so where prohibited by law. This warranty gives you specific legal rights. You may also have other rights which vary by jurisdiction.

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